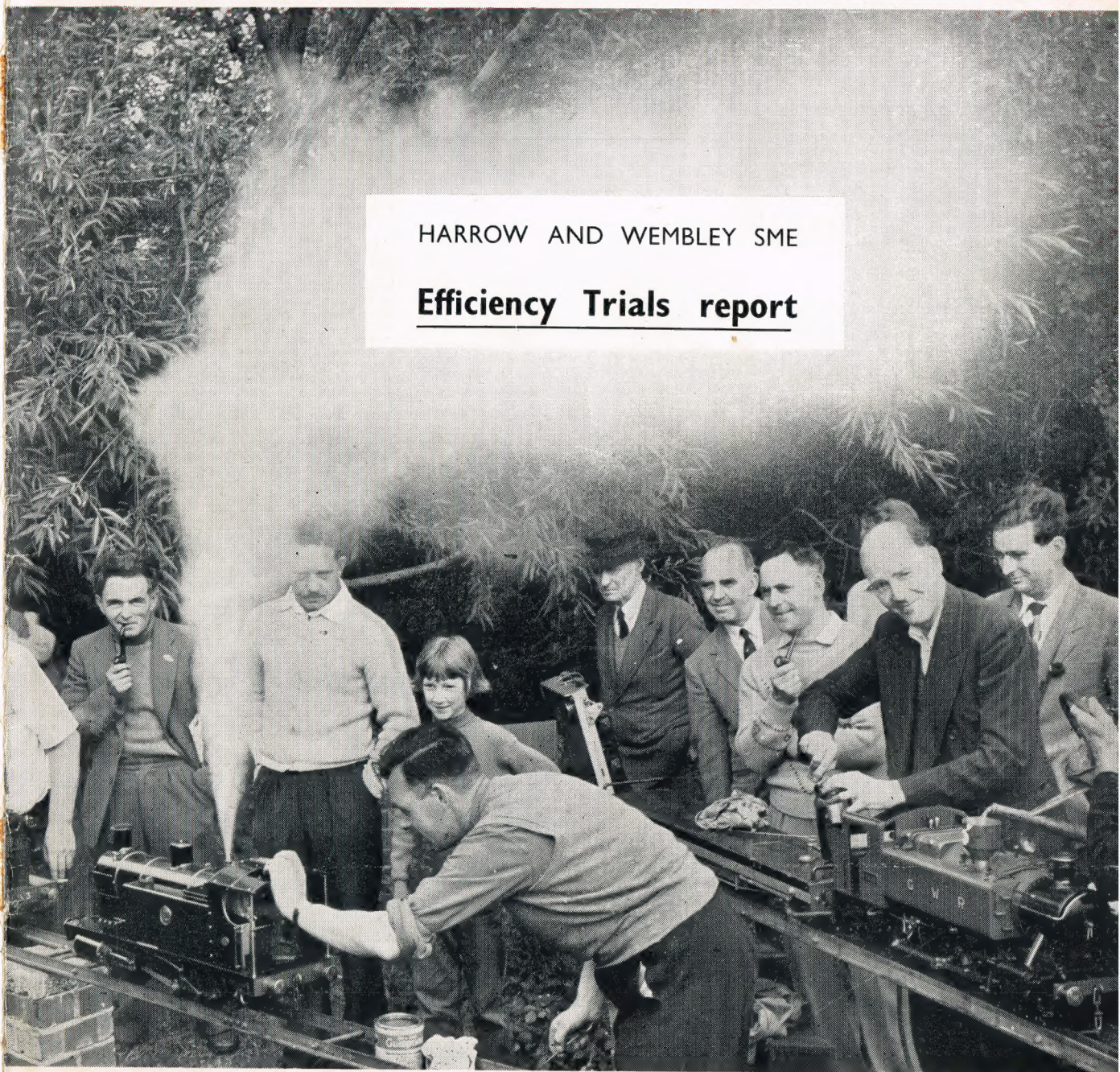


Model Engineer

THE MAGAZINE FOR THE MECHANICALLY MINDED

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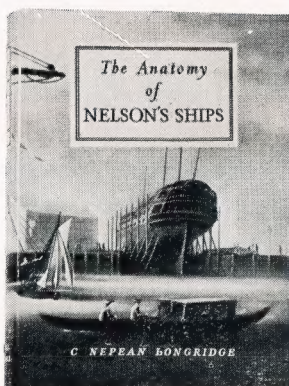
Efficiency Trials report



ONE SHILLING 12 DECEMBER 1957 VOL 117 NO 2951

Books: the Ideal Gift

THE ANATOMY OF NELSON'S SHIPS by Dr. C. Nepean Longridge. Describes the construction of the ships of the Nelson period with drawings and the only existing photographs showing the hull construction of two of the ships which actually fought at Trafalgar. Gives a complete description of the masts, spars and rigging of H.M.S. *Victory* and tells of how the author built his important model of her. A series of five large scale folding plates, showing both hull and rigging, complete what is undoubtedly a most comprehensive and reliable book. 272 pages. 63s., post 1s. (U.S.A. and Canada \$12.50, post paid).



SPRITSAIL BARGES OF THAMES AND MEDWAY by Edgar J. March. The history of stumpy, river, coasting, mulie and ketch barges, the details of their construction, the full story of the Sailing Matches and famous racing barges, together with complete plans and instructions for making miniatures of these picturesque craft. This delightful book, beautifully produced on antique paper, with art inserts in two colours, will have a wide appeal. 30s., post 1s. 9d. (U.S.A. and Canada \$6.00, post paid).

PERIOD SHIP MODELLING by R. K. Battson. Constructional notes with 65 diagrams on the making of a model Elizabethan galleon. This book is primarily for those who have made a start on this fascinating hobby and wish to acquire greater skill and knowledge. The pitfalls that await the beginner are numerous, but this book will help the modeller to avoid them. 3s. 6d., post 3d. (U.S.A. and Canada \$1.00, post paid).

MODELLING TUDOR SHIPS by R. K. Battson. The author's third and most ambitious book devoted to ship modelling. Surveys development in ship building and the establishment of the Navy on a permanent basis. The construction of the built hull is fully detailed, and together with "Period Ship Modelling" and "Ship Modellers' Workshop," the modeller will obtain complete information on his art. 88 pages, 50 illustrations. 4s. 6d., post 3d. (U.S.A. and Canada \$1.25, post paid).

SHIP MODELLERS' WORKSHOP by R. K. Battson. 82 pages, illus. In this book by the author of "Period Ship Modelling" the reader has at his disposal the experience gained in the author's 25 years of amateur and professional ship-modelling. The book is arranged in alphabetical order under the headings of component parts, and under each heading the modeller will find advice and guidance on the best and most effective means of producing the components in either modern or period style. 3s. 6d., post 3d. (U.S.A. and Canada \$1.00, post paid).

SHIP MODELLERS' LOGBOOK by John N. C. Lewis. 200 pages. A valuable introduction to lightweight ship modelling written especially for the beginner. After providing some essential background information on the various types of museum ship model and the evolution of the sailing ship through the ages, the author gives practical building instructions for a series of models, among them a decorative half model and a sailing model of a Grand Banks fishing schooner. The book is illustrated with many photographs of the models or the ships described and with 14 accurate scale plans. In addition, there are over 100 detailed drawings by the author. 7s. 6d., post 9d. (U.S.A. and Canada \$2.00 post paid).

THE MERCHANT SCHOONERS by Basil Greenhill. In two volumes, 60s. the pair. Postage 2s. 0d. (U.S.A. and Canada \$12.00, post paid.) Volume II can be purchased separately, price 30s., postage 1s. (U.S.A. and Canada \$6.00, post paid).

The period 1870 to 1940 is covered. The author tells how, why and where the schooners were built, how they were launched, equipped and manned, in what trades they were employed, the nature of the voyages, the speed of their passages and the reasons for their decline and inevitable end.

VOL. I is in two parts. Part I is an historical summary of the schooner trade and a detailed account of the method of building, illustrated with diagrams and drawings and some of the very few builders' plans in existence. Part II gives an account of those vessels that sailed from ports in the West Country. Vol. I is illustrated with over 70 photographs and many drawings and plans by David R. MacGregor and Roger Finch.

VOL. II contains a detailed account of the men who sailed the schooners and the sort of life they lived. A chapter on "Design and Management" explains the inter-linked story of the design of the ships and the way they were financed and run. There is also an account of the schooners from eastern and southern England. Part 2 of this volume is given over to a detailed study of the decline of the small sailing ship and the history of the development of the small auxiliary motor sailing ship. This volume contains the drafts, deck, spar and sail plans of the schooner *Rhoda Mary* and the ketch *Hobah*, and the drafts of the ketch *Clara May* all drawn by David R. MacGregor. It also contains a sail-maker's spar plan of the schooner *William Ashburner*, numerous drawings by Roger Finch, and over 60 plates.

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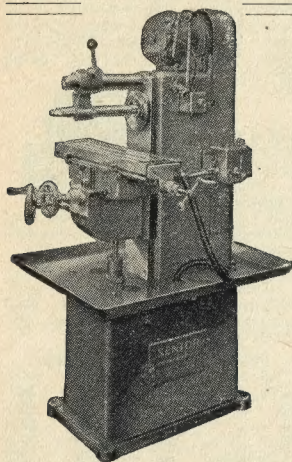
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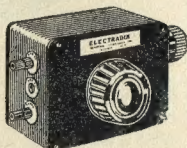
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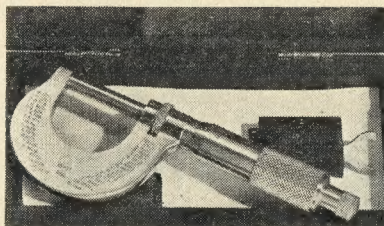
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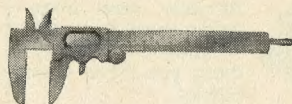


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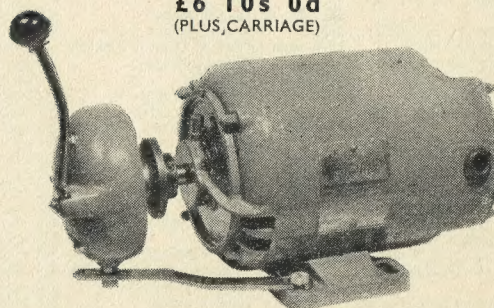
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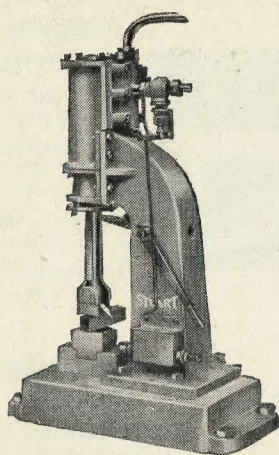
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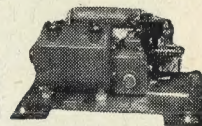
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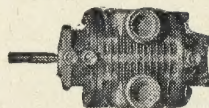
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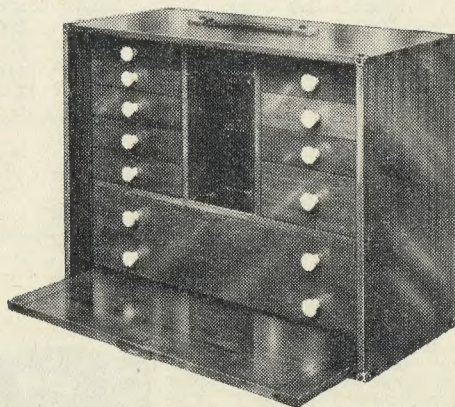
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Model Engineer

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A WEEKLY COMMENTARY BY VULCAN

J. W. COOPER, who contributes an article on de-magnetisation in this issue, is well known to ME readers for his technical discourses on electrical problems.

Mr Cooper, who was born at Great Yarmouth in 1888, served his apprenticeship with Muirhead and Co., of Elmers End, Kent, where he was lucky enough to see a great deal of the experimental work of Dr Muirhead and Sir Oliver Lodge.

Those were the days of the famous "Lodge spark," a feature in the ignition of early motor-cars, and in these days of international television it seems difficult to appreciate that even the elementary crystal detector had not then been developed.

After a spell of heavy engineering with J. H. Stone, of Deptford, he decided to take up electrical engineering as a career, and he has stayed in that and allied fields ever since.

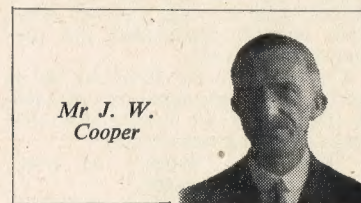
Still pioneering

In 1931 he joined the staff of the then North Metropolitan Electric Power Company, now integrated into the Eastern Electricity Board, and he retired from their employ three years ago after 23 years service.

But the pioneering spirit which animated his earlier life is still a power in the life of Mr Cooper. Today, at the wire-making factory of R. H. Symonds, of Enfield, he is doing research and experimental work

in the use of tungsten carbide dies for wire drawing.

Mr Cooper tells me that the work is ultrasonic and very interesting. He also does most of the tool work for the factory's die shop.



Mr J. W.
Cooper

Locos I have known

THE article in this issue is the last in the present series of "Locomotives I have known" by J. N. Maskelyne.

The series has been going on for nearly two years and has given a great deal of pleasure to readers, as well as provoking much thought and correspondence.

The break has been made at the request of J.N.M., to allow him to get busy at the drawing board and to build up a stock of the beautiful drawings around which the articles revolve. Such drawings take time, although they are a labour of love with J.N.M.

I hope that it will not be too long before he is back with another series—a hope which I feel will be shared by readers of MODEL ENGINEER.

Smoke Rings . . .

Polyphon library?

COULD not a league of polyphon lovers be formed and a record exchange library instituted?

This question is posed in "Miscellany," a daily causerie in the *Manchester Guardian*, in a paragraph telling of a polyphon that was purchased second-hand from a Manchester dealer for the princely sum of 30s.

That was 20 years ago and since then its 30 metal, indestructible records, tinkling out such classics as the "Bluebells of Scotland" and "The Belle of New York," have enthralled "rugby internationals, university professors and East End evacuees."

The case is inlaid, the picture inside the lid is "the best Victorian cherub-cottage-children style" and the machinery, despite the polyphon's 20 years in a nursery, is as good as ever.

Fire on the road

A MOTORIST dashed into Acle Fire Station, Norfolk, to call the engines to a vehicle which he had seen alight.

Firemen rushed to the scene of the conflagration, hoses at the ready. Sparks were shooting up from the vehicle, and an ominous red glow from beneath illuminated the surrounding darkness.

The firemen were about to aim a well-directed high-pressure jet of water at the seat of the flames when the driver's voice arrested them:

"Hold fast, mates," he cried. "This is a steam wagon."

I am indebted to Mr A. Atthill, of Norwich, for this item from the local *Evening News*.

Deisel-electrics

WHATEVER your opinion of diesel locomotives, it may interest you that 45 years ago the British Thomson-Houston Company, whose first main-line diesel-electric engine for British Railways modernisation has been formally handed over at Euston, was the supplier of equipment for an experimental petrol-electric railcar on the GWR.

As long ago as 1932, BTH was building diesel-electric locomotives for Ford of Dagenham. You may see those engines working at Dagenham today. Compared with some of the BTH products they are, at the age of 25, still young. The company can, for instance, point to rotary convertors

which are going strong in many parts of the world after 40 years.

This assurance of quality has given BTH a long series of important contracts. The company was formed under its present name in 1896 and two years later it received the contract for the power station, substations and locomotives of the Central London Railway, the famous Twopenny Tube which was opened in 1900, between the Bank and Shepherd's Bush.

Tramway equipment

By 1901 BTH had provided equipment for more than 20 tramway electrifications in Britain and overseas. Besides supplying motors and



C. T. Steeb, an ardent photographer of American transport, sent us this picture of a Californian street cable car

controllers for Britain's first overhead-wire electric tramway (at Leeds in 1891), Thomson-Houston actually operated the tramway for a number of years. In 1904 the company electrified suburban lines in the Newcastle upon Tyne and Liverpool areas.

Two BTH battery trains built in 1931 for the Great Southern Railways of Ireland were among the first rail vehicles to operate on this system. But BTH has been first in so many things that its record is woven into the history of electric traction. Go to Toronto or Melbourne, go to India, South Africa, or the Argentine—go almost anywhere and you will find some solid piece of work bearing those celebrated initials.

Greenwich clock

THE 24-hour clock outside the Royal Observatory buildings at Greenwich was out of action during the summer.

Cover picture

Two of the participants in the Harrow Efficiency Trials preparing their engines for a run. A report of this event appears on pages 807 and 808.

The clock, which was installed in 1852, is a familiar and popular sight to visitors to Greenwich. The original clock face was destroyed by enemy action in the 1939-45 war; a replica was subsequently presented and the hands were driven electrically from one of the observatory's master clocks.

When this was transferred to Hurstmonceux early in 1957 other arrangements had to be made. The Ministry of Works has now installed a new movement and the clock has been restarted.

The happy return

BACK in England for a while and enjoying the quiet lanes is the novelist C. S. Forester, creator of the immortal Hornblower. It was a delight to hear him in the BBC "Frankly Speaking" series.

Mr Forester brought with him the clear sea-air of commonsense. Answering with a firm, quiet cheerful, unaffected confidence, he interpreted his work in terms of craftsmanship and of the problems which a craftsman has to solve. This is not a fashionable attitude today in literature or anything else; yet when we look back over the past we see that it is the craftsmanly work which survives.

but it must be exhausted and sealed otherwise it will not do its job.

Next the charts. These are by Short and Mason Ltd, the barograph makers, and any optician who sells barometers and kindred apparatus will get them for you; this also applies to the little boat-shaped pen nib which is attached to the end of the pen arm.

Before starting to describe the actual construction a few words on what happens in the working of the instrument would, I feel, be useful as it may help you to figure out any modifications you may have to make owing to availability of material or different sizes of components.

Variations in atmospheric pressure caused by our old friends the "ridge of high pressure" and "trough of low pressure" cause the exhausted aneroid capsule to contract and expand. The total movement from extreme high to extreme low is very small, though—a little over $1/32$ in.

By means of the step-up levers and the very long pen arm this movement is magnified over 30 times at the pen-nib point. The chart is divided into days and hours, so it is possible to take the reading at any time of the day or night.

The peculiar form of the line drawn on the chart by the pen gives one an idea of what sort of weather to expect. For instance, a comparatively straight line drawn high up (say at 30.4) will indicate fairly settled fine weather whereas a wavy line low down (say 28.6) is almost invariably accompanied by very unsettled conditions.

A rapid fall is usually accompanied by violent wind and rain-storms and in tropical countries a tornado will cause the pen to describe a huge V from top to bottom in about two or three hours.

THE CONSTRUCTION

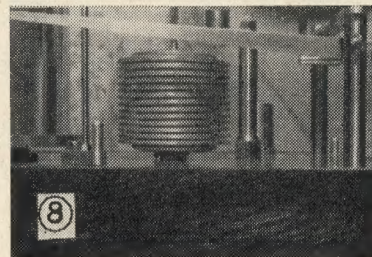
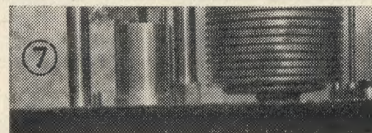
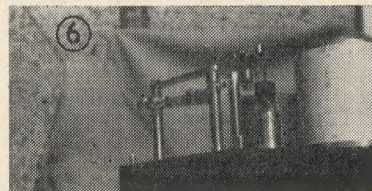
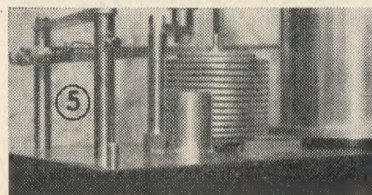
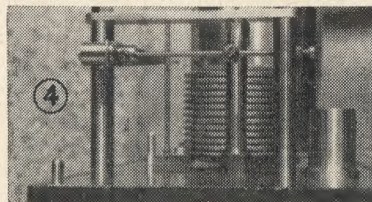
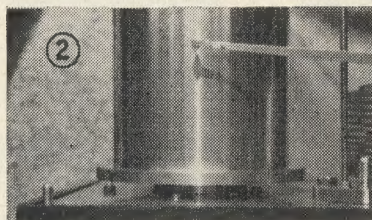
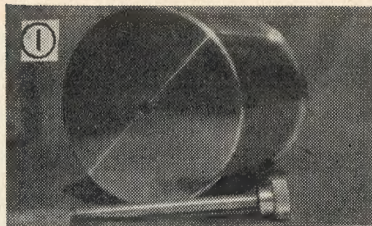
Now to work. It is not at all necessary to adhere to the drawings when mounting and building the drum assembly. The main requirements are: that it can spin freely, so ball-races are a must; the drum must revolve once in seven days; the distance from the point of the pen nib to the centre of the pen spindle must be $7\frac{5}{16}$ in.; the height from the baseplate to the centre of the pen-arm spindle must be 1.570 in., plus the amount the top face of the drum flange is raised from the baseplate.

By the "top face of the drum flange" I mean where the lower edge of the chart sits. The height of the pillar overhanging the aneroid and supporting the first lever can be varied to suit whatever type of aneroid capsule is used; it is not at all critical.

The baseplate may be of brass or

aluminium sheet. If brass $\frac{1}{8}$ in. stock will do; if aluminium, I would suggest a minimum of $\frac{3}{16}$ in. thick. My own was $\frac{1}{4}$ in. I just happened to have it. The size is $10\frac{1}{2}$ in. $\times$ $5\frac{1}{2}$ in. (Fig. 1).

First drill the four corner holes for the small pins which centralise the cover and tap 4 BA. Next drill or bore out the large hole for the drum spindle which is $1\frac{1}{8}$ in. I found it best to make this hole $1\frac{1}{8}$ in. first, then the drum spindle can be pushed



Top to bottom:

- 1 Drum top end and bolt
- 2 Drum turned from dural. This should be the right diameter so that the chart will lap round it correctly
- 3 Flange of the drum; ball-race housing underneath
- 4 Close-up of rear pillars. The spindle is seen on its centre points—also the screw clamping second lever. The screw clamping pen arm and pen arm counterweight are lightly riveted to the projecting end of the pen arm
- 5 The connecting link from the aneroid and small flats are milled on the rear pillars to accommodate the nuts that lock the spindle screws
- 6 The rear end showing the two pillars and second lever clamped on the spindle which receives the second connecting link from the long end of the first lever
- 7 The ink bottle receptacle
- 8 The vertical rod on the swivel base (left) which lifts the pen away from the chart when changing

through and the ball-race housings slipped on top and bottom and the three 6 BA holes in each housing can be spotted on to the baseplate, making six equally spaced at $1\frac{3}{8}$ in. PC dia. afterwards tapping out 6 BA.

Then, the $1\frac{1}{8}$ in. hole in the baseplate can be opened out to $1\frac{5}{32}$ in., thus ensuring that the spindle does not bind in the hole and all is concentric.

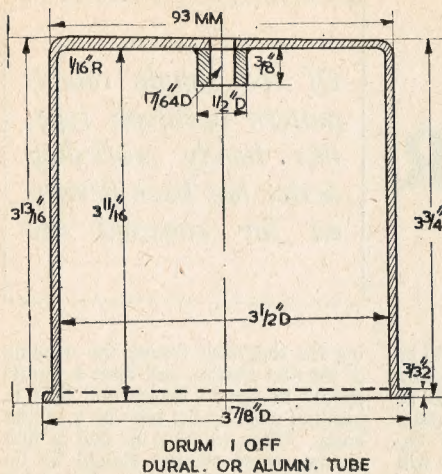


Fig. 3

Next, drill the hole for the pen-lift bar which is 2 BA clear. The hole for attaching the aneroid threaded end is shown $2\frac{3}{8}$ in. from the front edge of the base and $4\frac{1}{8}$ in. from the drum centre $\frac{5}{16}$ in. dia. This, again, may have to be altered to suit your aneroid.

Drill the hole $1\frac{3}{16}$ in. centres from the aneroid hole $\frac{1}{2}$ in. dia. for the first lever pillar. The hole for the ink-bottle receptacle is drilled and tapped 4 BA.

Finally, drill the holes for the pillars supporting the pen arm which are 2 BA clear and located $7\frac{7}{8}$ in. from the centre of the drum. This completes the baseplate with the exception of four 4 BA clearance holes for attaching the motor from underneath the baseplate.

I have purposely left these out as

they are rather irregular and are best spotted on to the plate from the holes in the motor flange. Make sure that the $\frac{1}{8}$ in. spindle is central with the $\frac{5}{32}$ in. hole in the plate.

DRUM AND MOTOR ASSEMBLY

The sectional sketch shows how the drum and motor are arranged. The two ball-race housings are screwed to the baseplate by 6 BA screws, three being in the top one and three in the bottom, placed alternately, producing a circle of six tapped holes in the plate. The motor is attached with four 4 BA screws and spacing pillars, as shown.

The drive is obtained by means of a small bossed flange on the motor spindle which is fitted with two small

pins which engage in two holes drilled in the bottom of the spindle. The races should be a push fit in the housings and on the spindle.

The drum flange is held to the spindle with three 4 BA screws and the drum itself is held down with the long $\frac{1}{2}$ in. bolt.

The ball races are $1\frac{1}{8}$ in. o.d. $\times$ $1\frac{1}{8}$ in i.d. $\times$ $\frac{3}{16}$ in. thick.

● To be concluded

PRESENT PROBLEM?

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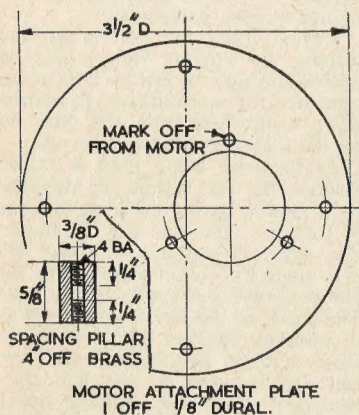


Fig. 5

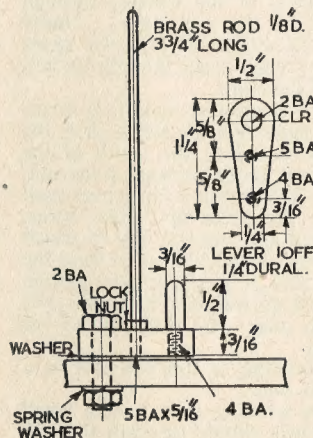


Fig. 6

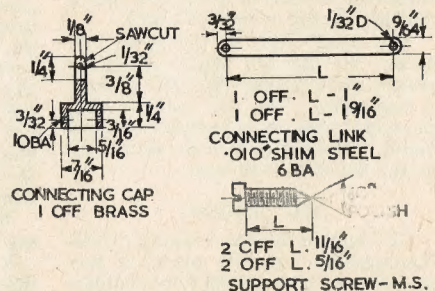


Fig. 7

An efficient DE-MAGNETISER

By J. W. Cooper

Of the simple round-pattern open/coil type, this handy workshop device has been designed for constant use

LITTLE seems to be available in information relating to de-magnetisers. But having to design one recently, I think this piece of apparatus may be of interest, and use, in the amateur workshop.

As its name indicates a de-magnetiser is for the purpose of de-magnetising metal objects that have become magnetised in some way and, when in this state, are either troublesome or, indeed, useless for their legitimate purpose.

Many modellers will have experienced the annoyance of a magnetised screwdriver and a tiny screw. Small springs and similar objects are difficult to deal with, and when watches become magnetised in some way they usually fail to function. Most magnetisable parts can be de-magnetised with the aid of heat—though this is sometimes impracticable because the article would as a result be rendered useless.

Under the influence of an alternating current field, de-magnetising can be satisfactorily carried out and without any damage to the object being treated. There are two styles of de-magnetisers, one an iron core on which is the energising coil, the other a simple solenoid coil.

In the former the magnetised article is brought close to the iron core after the current is switched on and then gradually moved away from the influence of the field. Sometimes a resistance is inserted in the coil circuit and the current reduced to zero.

The usual type is the open coil style. In use the article is slowly passed right through the coil while it is energised. The coil may be oval or round in shape, and series resistance could be used with it in the same way as for the solid core type.

THE BOBBIN

The bobbin for the winding of this de-magnetiser can be made in any available material: sheet fibre, leatheroid or stiff cardboard, etc. The bobbin can also be made in metal,

but where metal is used it should be observed that the whole structure must be sawn right through—that is, both the cheeks and the centre tube. The reason for this is that if the assembly is not slit in this way it will act as a short-circuited turn, in the same way as for a transformer.

My bobbin was made in wood and ebonite, being scrap available at the time. The tube should be carefully cut to length and trued, the cheeks should be turned to the diameter and the hole should be bored so that the tube is a nice tight push fit. The assembly is glued together, using thin Scotch glue, and any surplus remaining should be removed after the glue has set hard. Any good fixative can be used in place of glue, but it must be of a hard setting kind.

In addition to the two cheeks, a separator must be made to the same dimensions as the cheeks; this separator takes up a position at the middle of the tube, $\frac{1}{16}$ in. being a suitable thickness for the separator.

The energising coil of the de-magnetiser is wound in two sections; there is a reason for this. In a coil of high inductive value which has many turns, a potential difference or gradient exists between the inner and outer layers of the winding through the coil at the end turns. Under certain conditions of inductive stress breakdown can occur through the end turns of the coil.

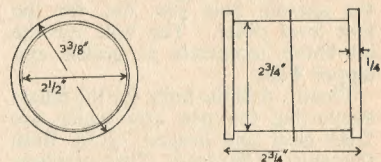
With a single coil—and it is necessary to cater for this stress—it is the practice to reduce the width of the layers from about halfway up the coil, the idea is to make a fairly long path between the inner and outer turns. The usual and normal way in which this stress is dealt with is to wind the coil in several sections; this method allows the potentials to be at one level for both inner and outer end of the winding.

The winding of this coil will be a sectional one.

Before winding is started, a small hole or nick should be made through the separator at tube level. Four spacers must be provided for support-

ing the separator during the winding of the first section, and these supports should be cut to length and held in position close to the tube by a rubber band. When winding the coil or first section, these spacers should be on your right-hand side when facing the coil and, as some form of winder is necessary, a lathe is ideal for this job, but it should be preferably foot-driven.

Whatever style of winding head is chosen, it must run absolutely true otherwise difficulty will be met in even layering of the winding. The two sections will be what is known as pile wound—that is to say, the wire



The bobbin

is wound on regardless of layering. This does not mean, however, that it can be wound on anyhow; the surface of the winding, as it proceeds, should be kept as level as possible, and hills and dales must be avoided.

Having fitted the bobbin on the winder, the winding wire should be pushed through the nick or hole in the separator for a few inches and stuck down to the tube; this wire must be on the side where the spacers are.

As the wire being used is rather delicate, the reel should be mounted on a spindle having the least amount of friction. The best way to handle fine wires during any winding job is to stand the reel in a jam jar or tin about double the depth of the reel. The cheek of the reel toward the top or winding direction should be made quite smooth beforehand, and the reel should stand on the floor immediately under the winding head. The wire is fed to the coil through the right hand, using the fingers as a

tension control. During winding the bobbin should revolve away from the operator.

Winding fine wire using a power drive needs some considerable practice from a control point of view. The best plan is to arrange for the winding head to be foot-driven. This method gives complete control of the operation. The left hand is free for braking or any other need during winding of the coil. This, together with the foot control, makes the whole set-up very flexible, and only sufficient tension should be put on the wire to enable it to lay up firmly but not tight—excessive

back and forth several times on itself so as to make a flexible length. This should be long enough to make two complete turns round the coil before it is tied down.

The bobbin should now be reversed on the spindle so that the vacant section is at the left-hand side. The wire coming through the separator from the wound section is jointed to the remainder of the winding wire, and insulated as explained. Winding may now be continued in the same way as for the first section. The reason for the reversal of the bobbin is to maintain the same winding

be given a light coating of an armature varnish at about every 2,000 turns. A suitable baking temperature is 200-250 deg. F. for two hours. Shellac varnish should not be used.

LOWER VOLTAGE

It occurs to me that it may be more convenient to operate this coil at a lower voltage through a transformer, and 12 and 24 v. are suitable values. For those wishing to build their own transformer, stampings having a core area of $1\frac{1}{2}$ sq. in. are suitable. The limb length should be $2\frac{1}{4}$ in., the coils being on the centre limb. The stampings used should be of E and U section.

A bobbin should be made for the windings, and this can be in grey fibre or any rather stiff material. The overall length of the bobbin should be $\frac{1}{16}$ in. less than the length of the limb.

When shaping the bobbin the limb measurements should be scribed on the fibre, and scored about halfway through its thickness. The strip should be bent on the side opposite to the scoring, and if this is done carefully a very sharp bend will result; the joint of this centre should be a butt one.

The cheeks are cut from the same material and shaped. The hole should be cut and filed so that the centre is a tight fit in the cheeks which are secured by thin glue. The cheeks can be re-inforced by using pieces of thin section cotton tape; these should be cut so as to go through the bobbin on the inside and up both cheeks and over the top into the winding space.

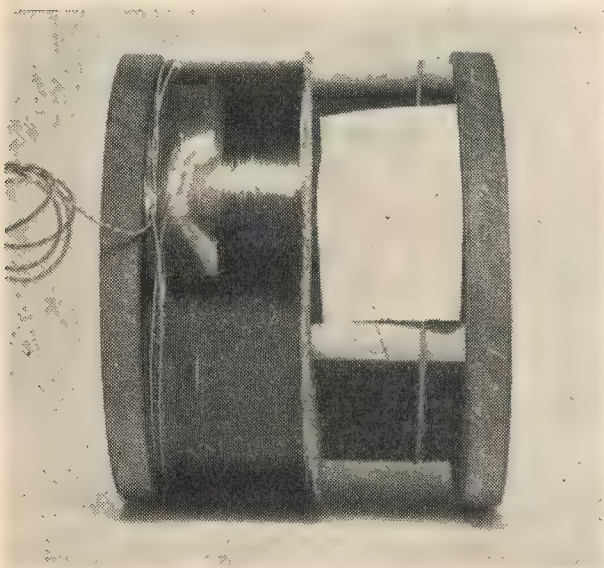
The tapes are glued in place, and the bobbin given a final gluing, after which it should be left to get hard.

WINDING THE COILS

For winding the coils a wood plug must be made to support the bobbin during winding. This should be slightly less in length than the bobbin and should be squared true with a suitable hole drilled through its centre. Two wooden supporting cheeks are necessary during winding. These are fitted at either end of the bobbin on the spindle which must be screwed for clamping.

In each of these supporting cheeks there should be a slot cut down and through the centre hole; it should be about $\frac{1}{2}$ in. wide, and the slots are for allowing the ends of the coil to be brought out without damage. The ends of the two windings are brought out at opposite cheeks.

Before starting the primary winding, a small hole should be drilled through the cheek at the base level. The winding wire is bent back and forth several times to make the tail, and enough must be allowed to make at



Wound section of the high voltage coil, showing joint

tension will lead to a stretched wire or more likely a break.

If a break occurs the two ends of the wires should be carefully cleaned for a short distance, twisted together and soldered, using a rosin flux, or a cored solder. After the joint is made it must be insulated; this is done by the use of a small piece of oiled silk. Two pieces should be cut. One is placed on the winding under the joint, the other on top of the joint, and the silk is held in place by successive turns as they come round.

A slight hump will occur at the place of the joint. This hump should be lost as winding proceeds by arranging for less turns to be laid at the joint position, the idea being to level up the winding so that it will finish evenly. When the requisite number of turns have been put on this section, a thick end must be put on the winding wire. This can be a length of fine flexible instrument cord, or the winding wire can be bent

direction; if this is not done, the two sections will be in opposition to each other.

WINDING FOR MAINS VOLTAGE

The winding for the bobbin will be 16,000 turns of 40 s.w.g. plain enamel covered copper wire. This is split into 8,000 turns for each section, and the approximate weight of the wire will be 14 oz. The coil is designed for operation on a standard 240 v., 50 cycle supply.

When the coil is wound it can be finished in several ways. A medium blind cord is suitable for overwinding and tying down, and a length of fibre can be cut or wrapped round the winding and stuck down with glue.

The coil is preferably fitted on a wood base—a switch and fuse should also be provided—and a pilot lamp is wired in parallel with the coil to give indication as to whether the coil is energised or not.

During the winding the coil should

DE-MAGNETISER

—continued

least one turn round the bobbin. It should be noted that when making this tail the free end of the wire should finish outside the coil; if this small point is not observed, there is always a chance that this free end may puncture some of the turns as they are wound on and so create a short circuit.

The winding should be a layer one, but if care is used pile winding may be carried out without loss of winding space for the secondary. The secondary is wound over the primary, but before this winding is put on, a strip of 10 thou. leatheroid should be cut a tight fit between the cheeks, and cut long enough to make two turns round the primary winding. This is temporarily tied or stuck down to the under turn.

It should be mentioned that before this strip is put on a hole should be drilled through the cheek for the finishing end of the primary, but care must be taken not to damage the top of the winding while doing this.

The bobbin should be reversed so that the primary tails are on the right-hand side of the coil and in the slot provided. A hole should now be drilled for the secondary inner end. This end must be long enough to anchor on to the chuck or winding head so that all strain is taken off the bobbin during the winding.

TAPPING THE WINDINGS

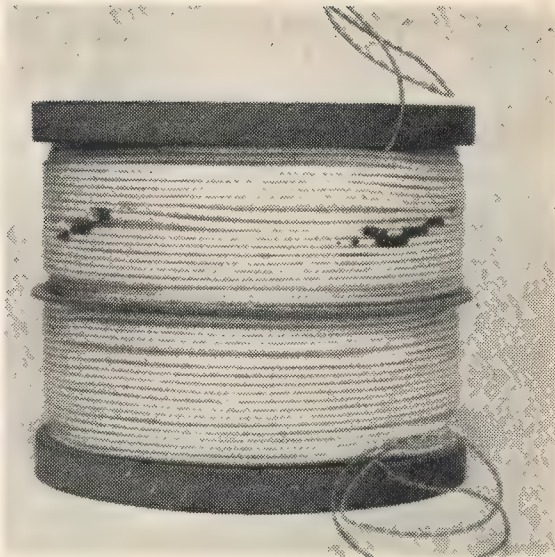
One winding will accommodate the two voltages; this means a tap must be brought out somewhere along the winding. There are several ways in which this tap may be brought out, the best method being to use a copper strip. This should be about 20 thou. in thickness, and $\frac{3}{16}$ in. wide. The strip must be cut to be long enough to come well above the coil, and it should be cut to twice this length. A piece of the winding wire is used to shape an eyelet at the centre, and the winding wire, after careful cleaning, is put in this eyelet and closed down round the wire. It is then soldered in position.

This strip should have a strip of insulating material brought up both sides of this copper strip. As winding proceeds it will be appreciated that no difficulty is experienced in maintaining an even layer past the strip.

Another way is to bend the strip sharply down on the existing winding and bring it up at the side of the cheek, but the choice is left to the reader.

The respective windings for the

The finished low voltage coil



transformer are: primary, 1,727 turns of 28-30 s.w.g. enamel single silk covered copper wire. The secondary is wound with 16-18 plain enamel covered wire. The total turns are 127 with a tap brought out at 64 turns for 12 v.

The windings for the de-magnetiser for the lower voltages can be of two styles; a single coil may be wound with a tap brought out, or a two-section coil can be wound. The total wire weight is 14 oz.

As a single coil the turns will be 1,600 of 24 plain enamel covered wire, with a tap brought out at 800 turns. If a series-parallel arrangement is carried out, then the total turns for the coil will be 800 of two wires in parallel.

Where a parallel winding is concerned it must be stressed that the two sections must not be wound over each other; two reels of wire are needed, and two wires are wound on at the same time. When connecting for the 12 v. range, both inner and outer ends of the two coils are connected in parallel and where the 24 v. range is concerned, the inner end of one section is connected to the outer end of the other section. The winding direction will now be the same in each coil.

Where all low voltage transformers are concerned, it is the practice to earth the secondary winding as well as the ironwork. The earthing should be done by using the inner end of the winding for the earth connection. ■

New wagons for British Railways

IN some respects the operation of goods trains in this country has lagged behind that overseas, particularly in USA, the main shortcoming having been the lack of continuous braking.

British Railways are now tackling this problem and have brought out three prototype wagons for the transport of liquids of all kinds.

The class A wagon which is suitable for the transport of inflammable liquids of low flash point is of straight-forward design, being 27 ft 9½ in. overall length on a wheelbase of 15 ft. The frames are of riveted construction, while the tank barrel is butt-welded.

The journals work in Skefco or

Timken roller bearings and one very interesting point is that the braking system includes two vacuum cylinders of 22 in. dia.

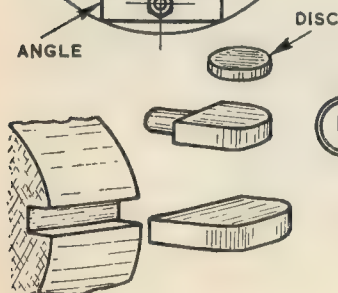
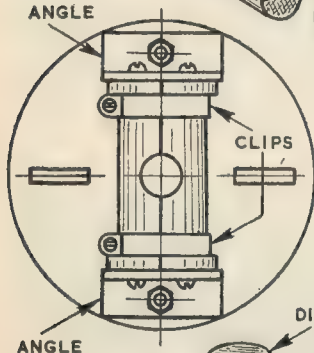
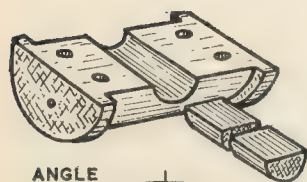
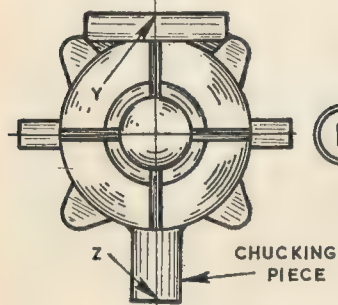
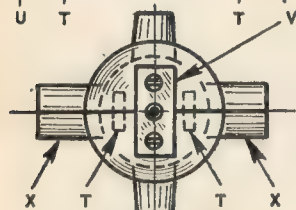
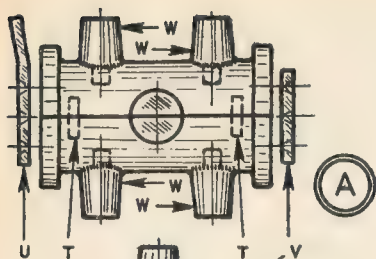
The brake arrangement is designed so that one cylinder only is used when the wagon is empty, and by means of a manually operated change-over gear, the second cylinder can be brought into operation when the wagon is loaded.

The class B wagon is for the conveyance of heavy liquids and chemicals, and is fitted with steam heating and bottom discharge on either side of the vehicle.

The third class is provided for the transport of creosote for British Railways service requirements. ■

Halved patterns

By Geometer



PRODUCTION of single simple patterns serving for casting both halves of symmetrical bolted-up components and of complete patterns in detachable halves when they contain numerous features, is often advantageous to reduce work in patternmaking and obviate difficulties that could arise in moulding.

As an example, the crankcase of a two-stroke engine, divided on the vertical centre line, may consist of identical halves cast from one pattern that has been made with care—when it would be needless to have made two identical patterns. On a similar principle, should one half of such a bolted-up component require an additional feature of a simple nature, the case can sometimes be met by sawing or machining that portion from the other casting.

Again, should the feature be too large for this method—or its removal from one casting require too much effort—it may sometimes be arranged for an additional piece to plug into or screw to the pattern for producing the more complicated casting.

In the case where a pattern is a simple type but contains numerous features each side of the centre line, difficulties may occur in moulding when one half has to be drawn off the pattern. But by making the pattern in halves, joined on the centre line, the pattern itself can separate, and each half then be carefully removed from the mould.

Where a solid pattern would be from a single piece of wood, a halved type demands two pieces half the section and located by two or four dowels, as at A, T, T, though other locating means are practical. A sheet metal drilling template will ensure accuracy of dowel holes, which should be clearance in one half of the pattern and interference in the other for the dowels to tap in. Alternatively, woodscrews entered to leave the plain portions of the shanks partly projecting, with the heads then cut off, can serve for dowels.

Turning of a halved pattern can be done in the lathe with hardly more trouble than for a solid type. If the dowelled halves are fairly short they can be mounted in a four-jaw chuck and adjusted true. If they are lengthy, metal plates can be attached at the ends, U, V, for a set-up to be obtained between centres, when the plate at the driving end can be long enough to engage the pin in the catch plate. In some instances, of course, woodscrews can be used to keep the halves together.

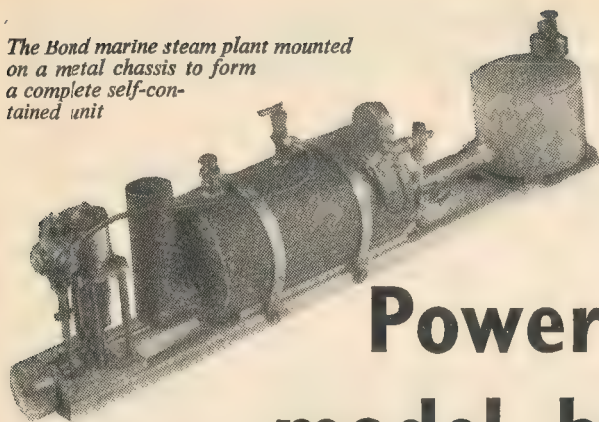
The bosses W—"complicating" features—may be solid, dowelled into the halves, and fillets made with plastic wood; but the bosses X, similarly circular, must be halved along the centre line, like the main portion of the pattern. These bosses are, of course, turned from two pieces of wood like the main portion, and one half attached to each half of the pattern.

In the case of a pattern for a crankcase casting, as at B, a half boss can serve as a chucking piece for machining the cylinder spigot and platform, since with the crankcase halves bolted up, the two half bosses form a round piece that can be chucked with reasonable accuracy after machining the outside. Afterwards they are cut off.

To serve as a chucking piece, a half boss should have about $\frac{1}{8}$ in. added to its flat face (a thin strip of wood), to clean off when the face of the casting is machined. Then the two pieces will be substantially round with the halves bolted up. For machining the outside, abutting faces of the castings can be marked and provided with centres at Y, Z. Then after bolting up a set-up can be obtained between centres.

Ordinary half bosses, as at A, can be let into each half of the pattern as at C, boring on the centre line. For this a long or awkward pattern may be clamped with worm-drive clips and mounted by light angles on the faceplate. Flat lugs, as at D, can be dowelled or let into grooves, and accurate radii formed by filing to steel discs. ■

The Bond marine steam plant mounted on a metal chassis to form a complete self-contained unit



Power for model boats

THE steam engine is the most flexible of all forms of motive power, in respect of ability to utilise a given amount of energy in the form of steam to produce practically the same amount of mechanical power, either at high speed and low torque or low speed and high torque.

This is perhaps one of the most attractive features of steam power; everyone knows how a steam locomotive can start a prodigiously heavy load from rest, and how a traction engine can haul a heavy lorry out of a ditch. This property is to some extent shared by electric motors, though in practice it is not quite so easy to exploit, owing to control difficulties and the danger of burning out overloaded windings.

Motors intended to deal with a very wide torque range generally have to be specially designed and constructed, whereas steam engines of quite conventional design will usually cope with all eventualities.

Marine duty involves very different conditions to those of road and rail traction, however, as the load characteristics are almost exactly inverted. In other words, very little power is required to start a ship from rest in still water, but considerable increase in resistance is encountered as the speed rises.

The ability of the steam engine to start up against heavy load, without the need of using variable-ratio gearing or friction clutch, does not, therefore, give it any practical advantage for marine work over engines of very limited torque range such as the petrol or diesel engine. But it does make it a very convenient form of power for very widely varied duties and simplifies such matters as the

selection of suitable propellers for attaining optimum performance of the craft.

For instance, an engine may be installed in a model cargo boat or tug, in which the usual practice is to employ a relatively large propeller running at a low speed, and it will be found to handle this kind of duty quite satisfactorily if supplied adequately with steam at a suitable pressure. The same steam plant may then be employed to drive a smaller or finer-pitched propeller at a much higher speed—either in the same craft or one of different type—and will perform equally well within certain limits. These limits are determined mainly by the structural design, including balance and economy in the weight of moving parts. For extremely high speed a specialised form of design, as already noted, is generally desirable.

It is thus much easier to arrive at a size and type of propeller which will give reasonably good hull per-

In the fourth article of this series EDGAR T. WESTBURY discusses the application and installation of steam plants

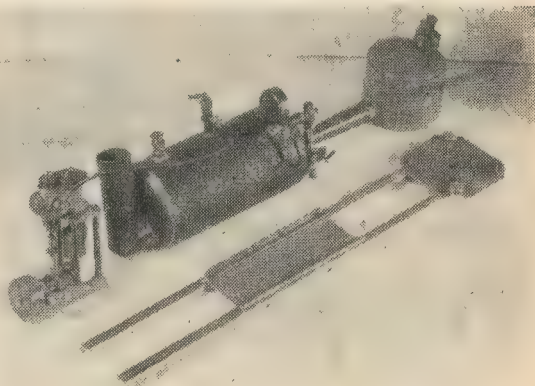
formance with a steam engine than with other forms of motive power, particularly i.c. engines. The pros and cons of different propeller sizes and speeds, however, deserve consideration, and this, indeed, will be given in a later article.

Owing to the "inverted" load characteristics in marine propulsion, there is no respite for the engine at full speed as there is with a locomotive; on the contrary, it is all collar work, like hauling a heavy freight train on a stiff gradient. The engine needs all the steam it can get, so that "notching up" of the valve gear is rarely possible, and its mechanical structure is heavily taxed. For this reason robust design and good lubrication are highly important factors in the success of marine plants which are expected to give a good performance, whether running at high or low speed.

However, as the power of the engine is often limited by the steaming capacity of the boiler, and this, in turn, by the heat which can be supplied by the burner, it commonly happens that the engine is working at well below its maximum potential efficiency, and many boats with poorly-built engines manage to jog along more or less satisfactorily.

If their owners are satisfied with this standard of performance, all well and good. But, as many readers have asked me for advice on how to improve performance, I emphasise that efficiency can only be attained by proper balance of the essential units of the plant—engine, boiler and burner

The components of the Bond steam plant shown separately, with the chassis in the foreground

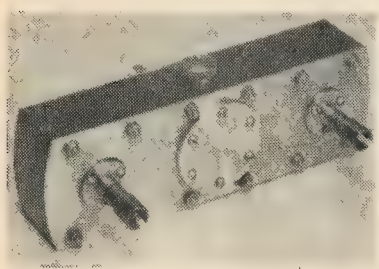


—either of which can, and often does, let the team down by not pulling its weight.

FEED PUMPS

I am often asked whether it is worth while to fit an engine-driven or separate feed pump to a marine plant. The answer to this depends very largely on the type of boiler employed; with an internal flue boiler having large water capacity, the feed pump may be said to be useful but barely worth while; with a water tube boiler, very desirable; with a flash boiler, absolutely essential.

A feed pump properly adjusted to supply just the correct amount of water to maintain the working level in the boiler will enable a boat to cruise for quite long periods, limited only by fuel capacity; but whether



The twin-screw gearbox for widely-spaced propeller shafts, as specified for
ST NINIAN

this is a very great advantage must be left to individual judgment. I have known boats with centre-flue boilers to steam for an hour without replenishment of water—and, in one case, a Scott water tube boiler is claimed to be capable of runs up to fifteen or twenty minutes. There is reason to doubt, however, whether the plants can be working at their maximum power capacity to make such long runs possible.

One practical point to be considered in connection with feed pumps is that they necessarily take some power to run and, in many cases, much more power than is generally supposed. This must necessarily lower the effective power available for propelling the boat, and though a separate steam-driven "donkey" pump eliminates this parasitic load on the main engine, it still taxes the steaming capacity of the boiler, which amounts to the same thing in the end.

For this reason many users of model steamboats find it more satisfactory to rely on a small hand feed pump, which can be given a few strokes every time the boat comes to the bank, or at such intervals as found

necessary. The possibility of a boat being hove to beyond the reach of the operator (through running aground on a mud bank or fouling of the propeller) must not be forgotten, however, and in this respect there is a strong case for automatic feed supply. In the latter case only a separate steam-driven feed pump would save the situation.

In reply to the many readers who constantly demand a "formula" for the dimensions of the feed pump in relation to that of the engine or boiler, I can only repeat what I have often told them in the past—that there is no solid basis for such a formula. The reasons for this have been fully explained in my previous steam engine articles. I shall be pleased to repeat them if called upon to do so, but for the present I trust that readers will concede this point. Adjustment of feed supply can be obtained in various ways, most of which have been described in MODEL ENGINEER at some time or other, but one of the simplest and most satisfactory is to vary the stroke of the pump plunger.

Pumps are generally driven directly from the engine or propeller shaft—in cases where low or moderate speeds are employed—up to a few hundred r.p.m. It is possible to design pumps to run at much higher speeds, but it will usually be found more efficient, both mechanically and otherwise, to use a larger pump geared down to $\frac{1}{4}$ or $\frac{1}{5}$ engine speed, if the latter is fairly high.

METHODS OF INSTALLATION

The practical details of fitting steam power plants to hulls of various types are the subject of numerous queries from readers, and as most of them present individual problems, it is difficult to lay down hard and fast rules in this matter. Much will depend on the form of hull structure and the provisions—if any—which have been made for installing the plant, such as

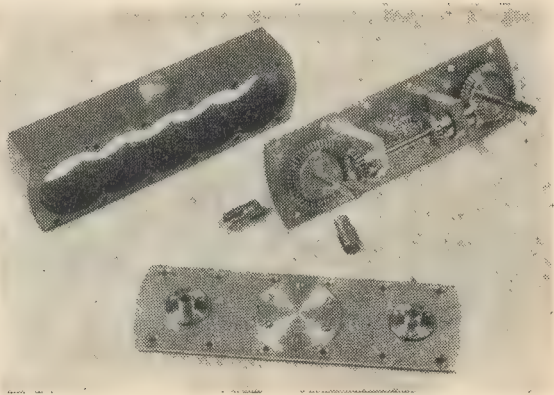
built-in longitudinal bearers or other convenient foundations. In wooden hulls built on the layer or bread-and-butter system, it is often possible to provide a flat floor in the bottom of the hold, to which the machinery can be attached by wood screws or bolts. Frame-built three-ply hulls of the hard chine or similar type should, wherever possible, have bearers incorporated in the structure, since there are no flat internal surfaces to which the plant can be secured.

In some cases, particularly in metal hulls, it is difficult to find locations for really secure fixing unless the structure is reinforced, or bearers of wood or metal carefully bedded down so that the stress can be evenly distributed over a large area of the hull.

I am a great believer in fitting the complete power plant—whether steam or otherwise—on a sub-frame or "chassis" so that it forms a single self-contained unit, which can be removed from or replaced in the hull with the minimum difficulty. This is particularly useful when it is desired to inspect, overhaul or test the plant, and it also simplifies the problem of ensuring perfect alignment of the engine and propeller shaft. It is often possible to obtain a perfectly secure and truly located installation with no more than four screws or bolts, the removal of which will enable the plant to be lifted out *en bloc* and in working order.

An example of a chassis-mounted unit is shown here, as applied to the engine, boiler and blowlamp made by Bonds o' Euston Road and recently reviewed in these pages. The frame is made from two strips of angle section light alloy (brass and steel angle have also been used in other plants), having attached seatings for the boiler and blowlamp. For larger and heavier-duty plants it may be found desirable to add cross members or other bracing.

The twin-screw gearbox dismantled



Power for model boats . . .

The boiler is held down by two bands of strip metal, preferably with tension adjustment, and it may be observed here that to improve thermal efficiency, it would be desirable to lag the boiler with asbestos or other heat insulating material, though this has not been done in the example illustrated. To locate the blowlamp in the correct position, which is essential for combustion efficiency, angle brackets are fitted to the platform; for fast or lively boats it is sometimes desirable to hold the container in place with spring clips, but, generally speaking, it is essential to be able to remove the blowlamp unit easily, for convenience in lighting up or clearing the burner jet.

One point worth mentioning about self-pressurised spirit blowlamps of the type reproduced is that they rely on heat transmitted back from the burner to the container to maintain the vapour pressure. If the lamp stands in direct contact with a metal platform as shown here, the cooling effect of the latter may cause the lamp mysteriously to lose pressure. The remedy is to interpose an asbestos mat to prevent the conduction of heat away from the container.

REVERSING AND REDUCTION GEARS

The great majority of model power boats have no provision of any kind for reversing, as practically all running is done at "full ahead," but where the utmost realism is aimed at, reversing gear may be considered desirable, and it is very useful for radio-controlled boats.

In the conventional form of double-acting steam engine, it is possible to incorporate Stephenson or other types of link reversing gear, but it adds a good deal to mechanical complication,

and is hardly justified except in fairly large plants, such as for boats of 6 ft length or over. The simple slip eccentric is quite an effective means of reversing an engine, but it is not self-starting, and this also applies to any single-cylinder engine whatever form of reversing valve gear is employed.

It follows, therefore, that to obtain direct reversing and self-starting, it is necessary to use not less than two double-acting or three-single acting cylinders with appropriate valve gear; it is up to the individual constructor to decide whether this elaboration is worth while, when a single-cylinder engine with a fixed eccentric will fulfil most propulsion requirements.

There is a strong case for the use of the simplest form of power plant, in conjunction with a *mechanical* reverse gear, in cases where it is deemed necessary to enable a boat to navigate either ahead or astern at will. This can be incorporated in the transmission system, so as to provide a reduction gear or a drive for two (or more) propellers from a single engine. Moreover, this method is applicable to any form of motive power, and can be operated by remote control with less effort than throwing over the links of a reversing valve gear.

Some months ago I described a simple and robust reverse gear in the article on "Reversing by Radio." This is designed to drive a single propeller shaft, but in later consideration of this problem, particularly

in the propulsion of the model of *St Ninian* by my colleague Edward Bowness, I hit upon the idea of using a similar principle in a self-contained twin propeller drive.

This has been employed in the example illustrated, which has been built and tested out in conjunction with a Warrior twin engine, a type well suited to this particular duty.

A TWIN-SCREW GEARBOX

It may be mentioned that the first form of gearbox to be tried out for this particular job was one which incorporated spur gears, which are usually accepted as being the simplest to apply and most efficient for this purpose. The gearbox, however, came out rather large and cumbersome, owing to the necessity for spacing the propeller shafts 4 in. apart as specified in the *St Ninian* design.

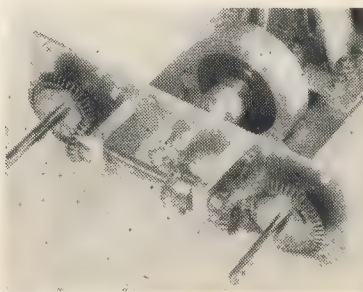
It was found that a much more compact arrangement was possible by using bevel gears, and, moreover, the shaft spacing does not depend on the size of the gears, but may be made flexible within wide limits. Bevel gears are not necessarily less efficient than spur gears, and they can be adjusted in mesh without relying on rigid accuracy of the shaft centres. The gears used are the stock type supplied by Bonds o' Euston Road, and having seen the equipment used in their production I am satisfied as to their accuracy.

One point of interest in the construction of this gearbox is the use of plastic material for the main casing. I have been fortunate in obtaining some offcuts of laminated phenolic board, including Tufnol, Paxolin and Panilax, either of which is suitable for the purpose. A piece of 1 in. material was trepanned out as shown, and the two endplates, made of duralumin, bolted to it front and rear.

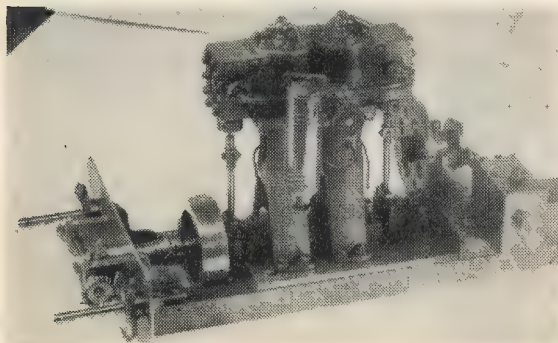
On the front plate, bearings for the cross shaft are mounted, and this carries one driving and two driven gears. The input shaft, which is arranged to be direct-coupled to the engine, drives the cross shaft at 1 : 1 ratio, and the latter drives the two output shafts in opposite directions, at a reduction ratio of 2 : 1.

It is hardly necessary to comment further on this gearbox, as the pictures are self-explanatory, and it is capable of being made in practically any size so long as suitable gears can be obtained. In this particular case no provision has been made for reversing. But I have designed a modification, suitable for construction by the same methods, or from castings, and I propose to describe this, with working drawings, in a later article.

● To be continued



*A close-up of the
bevel gearing and
engine coupling*



*The gearbox in
course of assembly
and the lining-up
of the input shaft
on the chassis of
the Warrior twin
engine*

EXPERIMENTS

with the

ME SEAL

—which, conducted by R. H. R. CURWEN, are followed by suggestions for the water-cooling of the OHV cylinder head design

WHEN built—with the cylinder head exactly in accordance with the drawings—the compression ratio of the Seal was found to be 3.4 to 1, and the engine, after its first season's running, was removed from the boat and mounted on the bench for test.

From the b.h.p. curves it will be seen how the output has been almost doubled by an increase of compression ratio from 3.4 to 4.3 which was obtained by machining 30 thou of metal from the cylinder head joint face. To raise the ratio still further it would be necessary to machine clearance pockets above the valve

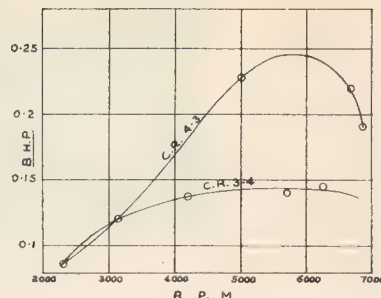
heads, but it was thought that gas flow between the valve chambers and cylinders would be restricted if the process of removing metal from the joint face was continued.

In *MODEL ENGINEER* for 18 January 1951 a simple method of brake testing was described by D. H. Chaddock. A series of calibrated fan brakes was used, and in testing the Seal I have, after checking the accuracy of the figures on a dynamometer, used similar methods. It should, perhaps, be mentioned that the data used by Mr Chaddock was subsequently revised by the originator of the system, P. R. Payne—and all h.p. readings taken from these particular graphs should, therefore, be reduced by approximately 23 per cent to give the true figures.

MEASUREMENT OF COMPRESSION RATIO

For this operation, I have found the plasticine method both simple and accurate, and I feel it will bear repeating. Thus, before fitting the cylinder head, the combustion chamber is fitted with plasticine and pressed on to the block, the piston being, of course, on top dead centre. Any surplus plasticine is carefully trimmed away until an exact fit is made on the block.

After removal the material is rolled



The brake horse power curves obtained during tests of the Seal

between two flat surfaces into a true sphere, the diameter (D) of which is accurately measured. The volume of the combustion space C can then be calculated from the formula $\frac{D^3\pi}{6}$.

The cylinder displacement V is equal to $\pi R^2 S$, where R is the radius of the bore and S the stroke, from which the compression ratio will be $\frac{V+C}{C}$.

THE OHV CONVERSION UNIT

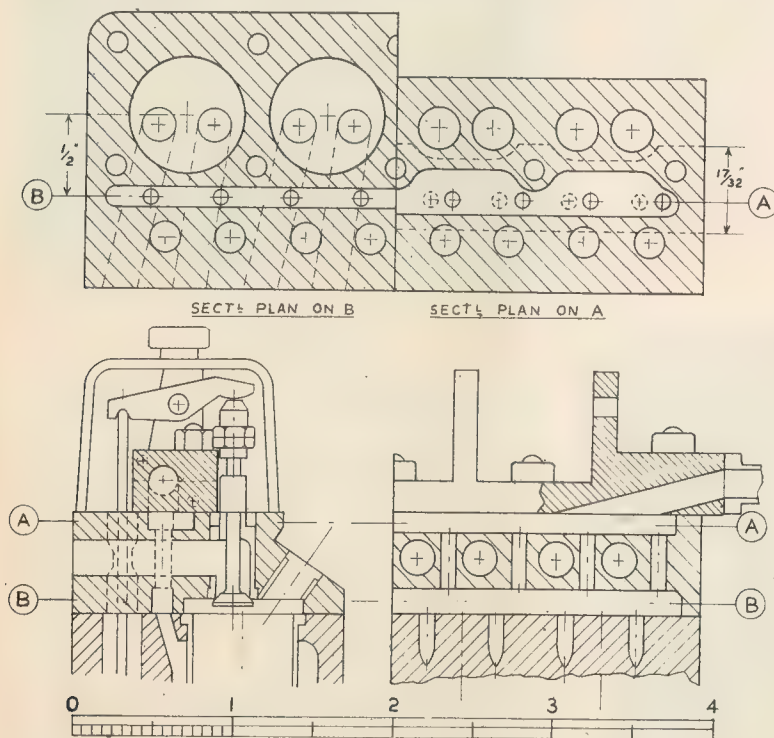
It has been suggested that the o.h.v. unit described in *ME* on August 29 of this year will suffer from overheating troubles unless water cooling can be added. I must agree that in view of the fact that the design is untried, this may well be the case. Though I can find no way of passing water through all parts of the head, it is, however, a fairly simple matter to form small passages by end-milling and drilling.

The amended drawings show where the channels can be milled, both in the upper and lower surfaces of the head—the lower being fed by water via eight holes of $\frac{3}{32}$ in. dia. connecting with the cylinder jacket.

The two channels are also connected by eight holes of the same diameter, spaced to pass between the inlet and exhaust passages, the outlet being formed at one end of the rocker bracket which (to allow this) is increased in depth as shown.

Two other modifications from the original dimensions will be required, namely a reduction in the diameter of the ends of the push-rod clearance holes to $\frac{3}{16}$ in., and the re-sleeving of the original valve liner holes with a neat fit at the top flanges in order to prevent water leakage at these points.

In conclusion, may I urge anyone who is courageous enough to make the experiment of building a conversion of this type, and also those who have experience of these small multis, to tell us about it. ■



Plan and sectional drawings showing all water passages

MPB REGATTAS

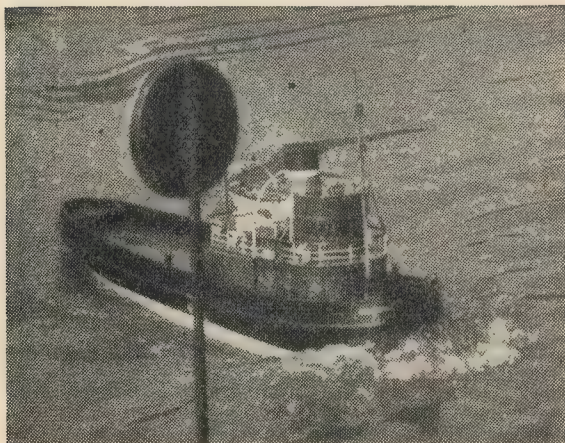
PORTSMOUTH

J. Hampton reports on his club's first MPBA event which was held this year on Southampton lake

THE Portsmouth Model Power Boat Club held its first MPBA regatta this year, and, as hydroplanes are not allowed on the club's home water, the event was held on Southampton lake.

Although rather late in the season, a number of enthusiasts made the trip South and enjoyed a fine afternoon's racing. In the straight running events A. Loe (St Albans) was the most successful, winning the steering competition with ten points and gaining second place in the nomination race. P. Miller (Portsmouth) and F. Waterton (St Albans) tied for second place with nine points each and three re-runs were needed to separate them.

Right: The QUEEN MARY by A. Loe (St Albans). Below: A petrol-driven tug ACKLAM CROSS by F. Waterton (St Albans)



RESULTS

Nomination Race, 40 yd

1 Whitty (Southampton), SH 26	...	...	...	1	per cent error
2 A. Loe (St Albans), Queen Mary	...	...	...	1.4	" " "
3 A. Warner (Portsmouth), PM 5	...	...	...	1.7	" " "

Steering Competition, three runs

1 A. Loe (St Albans), Queen Mary	...	...	...	10	points
2 P. Miller (Portsmouth) Pym	...	...	...	9 + 3 + 3 + 5	
3 F. Waterton (St Albans), Acklam Cross	...	...	...	9 + 3 + 3 + 1	

500 yd Class A race

S. Clifford (St Albans), Poly Ester	...	...	...	68.18	m.p.h.
2 F. Waterton (St Albans), Tally Ho	...	...	...	44.47	"

500 yd Class B race

1 F. Jutton (Aldershot) Nike	...	...	...	60.16	m.p.h.
2 J. Skingley (Victoria)	...	...	...	53.8	"

500 yd Class C race

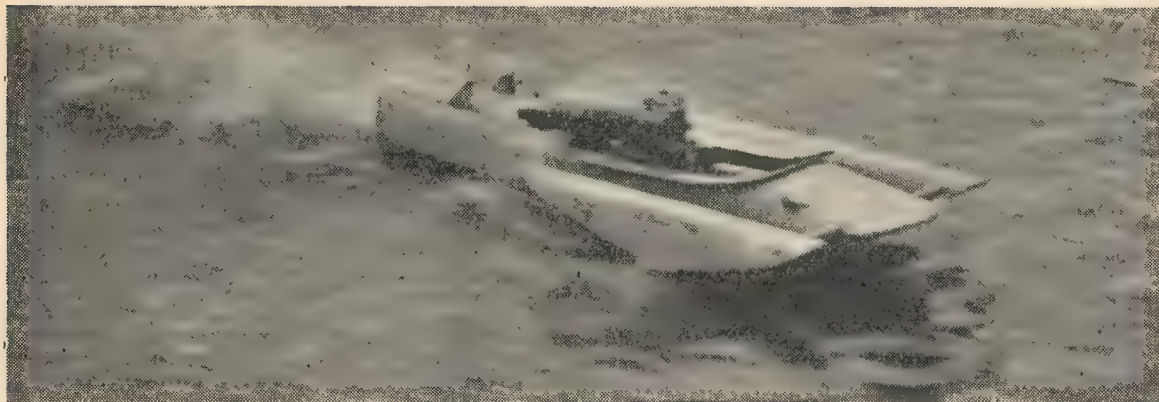
1 R. Phillips (St Albans), Foz 2	...	...	...	69.1	m.p.h.
2 J. Hampton (Southampton), Jim	...	...	...	53.8	"

500 yd Class C restricted race

1 C. Stanworth (Bournville), Spur	...	...	...	60.16	m.p.h.
2 K. Turner (Bournemouth), Hotsy	...	...	...	57.78	"

500 yd Class D race

1 K. Hyder (St Albans), Slipper 2	...	...	...	33.5	m.p.h.
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TALLY HO !—an A class hydroplane by F. Waterton (St Albans)

An interesting boat making one of its rare regatta appearances was the paddle steamer of Mr Boyce (Portsmouth). This boat is 8 ft 6 in. long and weighs 1½ cwt, but is most realistic when under way.

During the speed events S. Clifford's *Poly Ester* achieved one of its best regatta speeds to date, winning the A class race at 68.18 m.p.h. On this boat's second run a somewhat frightening incident occurred when a dog took a dislike to *Poly Ester* but, fortunately, the boat just missed it each time and no damage was done.

R. Phillips' *Foz 2* was well on form, recording top speed of the day 69.1 m.p.h., thus winning the C class race. K. Hyder was unable to get *Slipper 5* going on either run, but made up for this by winning the D class event with *Slipper 2*. ■

An 8 ft 6 in.
paddle steamer
by Mr Boyce
(Portsmouth)



FLOOKIN, a steam turbine-powered launch by R. Mapplebeck (St Albans)



LOCOMOTIVES I HAVE KNOWN

WHEN dealing with Mr H. S. Wainwright's Class D 4-4-0 engines (article No 40 *ante*), I mentioned, among others, his "singularly fascinating 0-6-0 goods engines," and I am devoting this final article to them.

There were 109 of them, the first examples being put into traffic in 1900 and the last in 1908. They were simple, straightforward 0-6-0s with

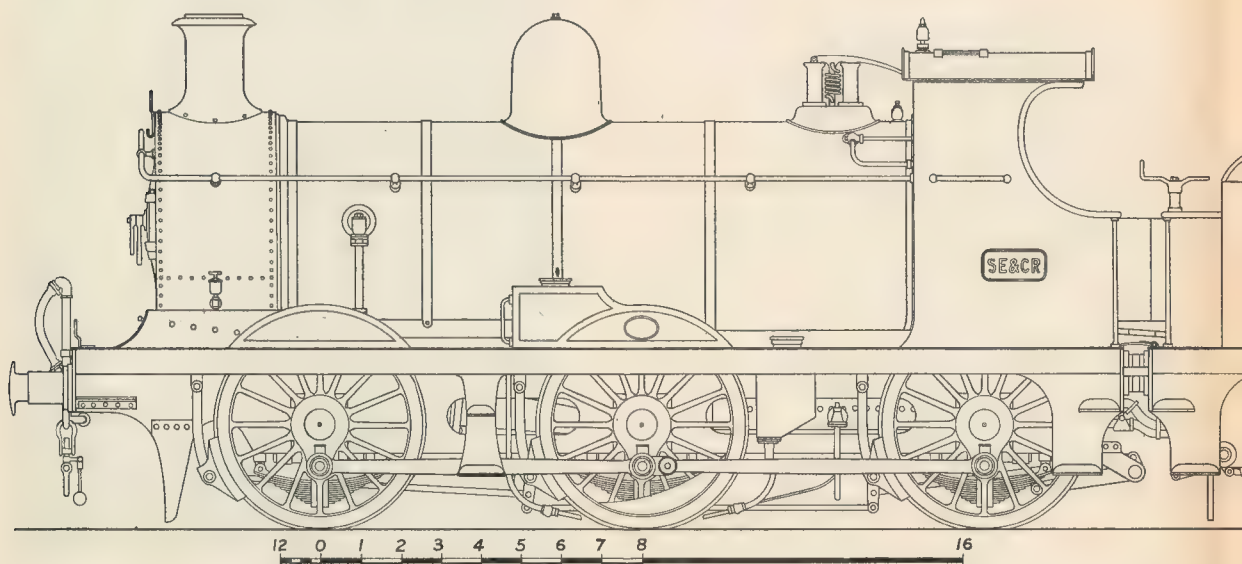
balance weights in the wheels, and, although Wainwright discontinued this practice, his C Class engines were rather unusual in having balance weights in the middle pair of wheels only.

My drawing shows No 712, an engine which was under my charge at Cannon Street during the strike of 1919. She was typical of the class except that she was one of a number that were fitted with short blastpipes

wright engines always gave the impression that they were really getting down to good hard work, and not to some sort of drudgery.

The principal dimensions of this class were: cylinders $18\frac{1}{2}$ in. dia., 26 in. stroke; the steam chest was between the cylinders, and the valves were operated by Stephenson link motion which was interchangeable with that on the H Class 0-4-4 tank engines (article 45). The same valve

Number 48 by J. N. Maskelyne



nothing specially remarkable about them; yet they have worked steadily on goods, and not a little passenger traffic for more than fifty years—and many are still doing it.

Fifteen of these engines were built by Neilson, Reid and Co., Glasgow, in 1900; another fifteen by Sharp, Stewart and Co., Glasgow, also in 1900, while nine were constructed at the old Longhedge Works of the London Chatham and Dover Railway, two in 1902 and seven in 1904. All the rest were built at Ashford.

This class largely superseded the Stirling O class which was designed by James Stirling for the old South Eastern Railway, and first built in 1878. Incidentally, these Stirling engines were noteworthy in having no

and, consequently, had much shorter chimneys than normal for the class. As a result of this short chimney, the height of 13 ft $1\frac{7}{8}$ in. from rail to chimney top was reduced to 12 ft $6\frac{3}{4}$ in., and gave the engines a very sturdy appearance.

They appeared to be ready to tackle any job that offered itself, and were frequently used for working heavy excursion trains to Kent Coast resorts at holiday times. At work, they were inclined to be noisy, but in a subtly different way from that of some other noisy locomotives. For these Wain-

setting was used in the two classes, and it certainly appeared to enable the engines to reach and sustain quite high maximum speeds when necessary.

The wheel diameter of the C Class was 5 ft 2 in., and the wheelbase was divided into 8 ft plus 8 ft 6 in.; the front overhang was 6 ft and the back 3 ft 4 in., the total length of the main frames being 25 ft 10 in.

The boiler was pitched 7 ft 7 in. from rail level; it was made in two rings, the maximum diameter of the larger ring being 4 ft 7 in. There were 214 tubes of $1\frac{1}{2}$ in. dia., giving 1,089.32

Wainwright's C Class 0-

sq. ft of heating surface; to this the firebox added 110.68 sq. ft, making the total heating surface exactly 1,200 sq. ft. Inside, the firebox measured 5 ft 1 $\frac{5}{8}$ in. long and 3 ft 4 $\frac{3}{8}$ in. wide, the grate area being 17 sq. ft. I must add that the boiler barrel was 11 ft 1 $\frac{5}{8}$ in. long between tubeplates; the tubes were cambered 1 $\frac{5}{8}$ in. and the working pressure was 160 p.s.i.

In working order the engine weight was 43 tons 16 cwt, all of which was, of course, available for adhesion. It was divided into: leading, 14 tons 15 cwt; middle, 15 tons 5 cwt, and trailing, 13 tons 16 cwt.

Originally, these engines presented an unusually smart appearance for goods engines because they were painted in Wainwright's standard livery with all its elaborate lining, and were provided with a polished brass dome, safety-valve cover and fillet

The tender was similar to the one described for Wainwright's D Class engines in article 40, with capacity for 3,300 gallons of water and 4 $\frac{1}{2}$ tons of coal. Several were subsequently fitted with raised coping at the sides of the coal space to increase the capacity to about five tons.

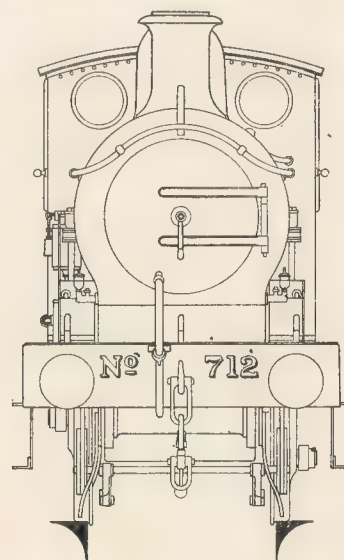
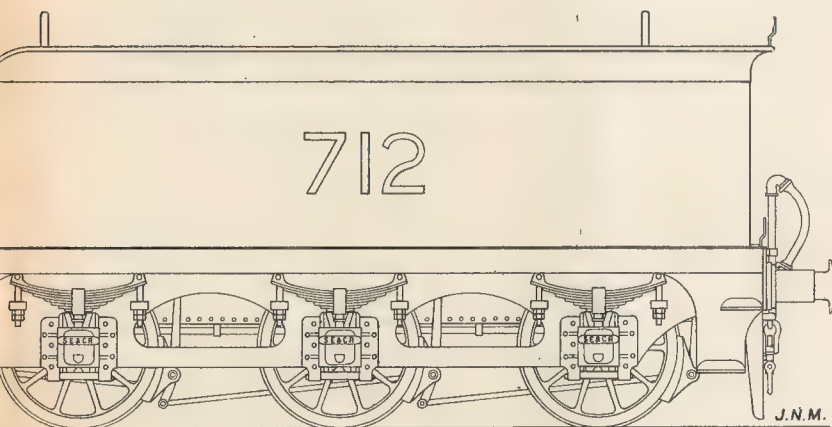
All these engines were equipped with the automatic vacuum brake, steam reversing gear, steam sanding apparatus and Stone's patent sight-feed lubricators for cylinders and valves. Most of the engines had sandboxes arranged as seen in my drawings, but in some, additional sandboxes were provided below the running plate just ahead of the leading wheels.

Nos 711 to 725, built by Sharp, Stewart and Co. in 1900, were fitted with the Westinghouse air brake, as well as the normal vacuum brake; the air pump was mounted on the right-hand side of the engine, between

ever, was made to No 685 which, in 1918, was rebuilt into a 0-6-0 saddle-tank shunting engine. In this form, she was re-classed S, but she remained the sole example of that class until she was broken up in 1955.

The rebuilding entailed no alterations to the boiler, cylinders, wheels or valve gear, but the frames were extended at the rear end to accommodate the bunker and enlarged cab, the trailing overhang being increased from 3 ft 4 in. to 8 ft. A large semi-circular saddle tank, of 1,200 gallons capacity, was slung over the boiler barrel, and I believe I am right in stating that this was the first and only saddle tank built at the Ashford works.

In her altered form 685 weighed 53 tons 10 cwt in working trim, 17 tons 10 cwt resting on each of the leading and driving axles and 18 tons 10 cwt on the trailing axle. The



-6-0's, SECR

at the junction of the smokebox and boiler barrel.

In 1912, this elaboration was replaced by a very much simpler livery, and a few years later, during the 1914-18 war, this simpler style gave way to a plain dark grey all over—without any lining whatever—though the chimney and smokebox were black as before. The lettering and the number were white. My drawing indicates this war-time style of painting, which remained the standard style for all SECR engines until after 1923,

the cab and the middle splasher.

The cabs of these engines were quite roomy and comfortable, the roofs being provided with sliding ventilators, while the spaces at the sides, between engine and tender, could be closed by double-folding doors for lessening the draught on the footplate when running.

It is worth recalling that in 1919 No 686 was given an extended smokebox, the front of which was brought to within 3 in. of the leading buffer beam. Apparently, the results obtained did not justify a general adoption of this feature, as no other engine of this class was similarly treated and, after a year or two, 686 was restored to her original condition.

A more extensive alteration, how-

capacity of the bunker was for two tons of coal.

A sort of "accidental pimple" of a dome was mounted on top of the saddle tank, and a pair of Ross pop safety valves replaced the original Ramsbottom type. The engine was equipped with powerful steam and hand brakes in addition to the usual vacuum brake, and was used exclusively for shunting and marshalling goods trains and passenger stock in the sidings at Bricklayers Arms. She was withdrawn in the latter part of 1954.

No other alterations worth mentioning were made to any other engines of the class, the survivors of which still find plenty of work to do in various localities in the Eastern section of the Southern Region. ■

ROSE

In this instalment LBSC describes the tender arrangements for the locomotive with the spirit-fired boiler and gives variations for the coal-fired version

Continued from 28 November 1957, pages 740 to 742

ALTHOUGH there is considerable difference in the internal arrangements of a tender for a spirit-fired locomotive, and one with a coal-fired boiler, both are used with the same tender body. It will save time and space if I deal with them both together.

The back corners of the tenders supplied to the GER mixed-traffic engines were square, not rounded like certain other types, and the corners of the flared coping were mitred. Therefore, it will be easiest to build the tender body as a three-piece job, two sides and a back, forming the sections of coping in one piece with each plate.

First fit the soleplate to the chassis. This is a piece of 16-gauge sheet brass 10 in. long and $4\frac{1}{2}$ in. wide. Make sure it is truly rectangular by testing each end with a try-square. Set it on the chassis so that the overlapping at each end and side is the same, then attach it to the tops of the beams by two 3/32 in. countersunk brass screws at each end. Drill No 41 clearing holes through the soleplate and beam tops, and put nuts on the screws underneath the beams. This allows the complete body to be removed from the chassis at any time if required by simply removing the nuts.

Bending the copings

Each side sheet will need a piece of 20-gauge sheet brass (hard-rolled is best if obtainable, as this is dead flat) $9\frac{1}{2}$ in. long and $2\frac{1}{2}$ in. wide. Cut one of the long sides at one end to form the curved part of the front end of the coping, then cut away $\frac{1}{4}$ in. of the other end leaving the overhanging part of the coping as shown.

Before I had a bending machine I formed my copings by gripping the edge to be bent between two pieces of round rod a little longer than the tender side, and putting the lot between the jaws of the bench vice, with the rods level with the top. With the aid of a piece of wood about $1\frac{1}{2}$ in. square, and longer than the rods, the projecting sheet of metal was forced down at right angles to the

part gripped between the rods, and a nice even coping was the result.

The back requires a piece of 20-gauge sheet brass $4\frac{1}{2}$ in. $\times$ $2\frac{1}{2}$ in. Cut away $\frac{1}{4}$ in. of both ends leaving the curves at the top as shown, then bend as described for the sides. The dimensions given in the drawings show the approximate height of the sides and back after the copings are formed.

Next rivet on the pieces of angle to which the removable tank top is attached. These are $\frac{1}{4}$ in. $\times$ $\frac{1}{8}$ in. section, 6 in. long, and they are fixed to the sides at $2\frac{1}{8}$ in. from the bottom. A similar piece is riveted along the back. Use $\frac{1}{16}$ in. brass or copper rivets.

On this small tender there is no need to rivet angles along the full length of the lower edges; if a piece about 1 in. long is attached at each end, and a similar piece about midway along the side, it will be plenty strong enough. The end and sides can be joined by riveting a piece of angle in each corner, as with the cab.

To attach the sides and back (thus far assembled) to the soleplate, drill a No 43 hole in each bottom angle, set the assembly on the soleplate with the back $\frac{1}{8}$ in. from the edge, and the sides $\frac{1}{4}$ in. from each edge. Tack the lot in place with a little blob of soft solder at each angle, then put the No 43 drill through the holes in the angles, making countersinks on the soleplate. Follow with a No 50 drill, tap 8 BA and put in brass screws of any shape head. Finally solder all round the bottom on the inside, and over the angles at the corners, to make the lot watertight.

COMPARTMENT FOR SPIRIT

First fit the division plate which separates the spirit and water sections. This is a piece of 20-gauge brass $2\frac{1}{2}$ in. wide and just long enough to fit nicely between the sides of the body. Rivet a piece of angle at $\frac{1}{16}$ in. from the top, and another piece along the bottom. The top piece must be cut to fit between the angles attached to the sides.

The plate is then put in the position

shown, butting up against the front ends of the side angles and soldered along the bottom and up the sides. A couple of 8 BA brass screws can be put through the bottom angles into the soleplate for extra strength, and soldered over.

The front plate of the spirit compartment is just a piece of 20-gauge brass $2\frac{1}{8}$ in. $\times$ $4\frac{1}{2}$ in. Bend over about $\frac{3}{16}$ in. of each end to a right angle, so that the plate fits between the tender sides, then set it in place $\frac{3}{8}$ in. from the front edges and square with the sides. Solder it in place, no rivets are necessary, as there is neither heat nor pressure to resist.

The top cover is a fixture. Cut a piece of 20-gauge brass approximately $3\frac{1}{2}$ in. $\times$ 4 in. full, to cover the top of the compartment. This should fit exactly between the tender sides, butting up against the top edge of the division plate and resting on top of the front plate.

Before fixing it, drill a $\frac{1}{4}$ in. hole on the centre line, $\frac{3}{8}$ in. from the front edge, and another at $1\frac{1}{4}$ in. behind it. Fit the plate in place and solder it all round, making sure that no places are missed and the joints are absolutely tight. If there are any air leaks it is goodbye to the automatic action of the spirit feed.

Put a $\frac{1}{4}$ in. drill down the rearmost hole and carry on right through the soleplate. Open out the upper hole to $\frac{3}{8}$ in. and the hole in the soleplate to $\frac{5}{16}$ in. clearing. At $\frac{1}{2}$ in. behind this drill a $\frac{3}{8}$ in. hole for the air pipe. This is a $3\frac{1}{2}$ in. length of $\frac{3}{8}$ in. copper or brass tube bevelled off at one end as shown, pushed through the hole in the soleplate so that the upper edge of the bevel is 1 in. from the soleplate, and soldered in position.

SPIRIT VALVE AND AIR PIPE

To make the spirit valve, chuck a piece of $\frac{3}{8}$ in. hexagon rod, face, centre and drill to $\frac{1}{8}$ in. depth with 3/32 in. drill. Open out and bottom to $\frac{1}{2}$ in. depth with 7/32 in. drill and D-bit, then tap the end $\frac{1}{4}$ in. $\times$ 40. Turn $\frac{1}{2}$ in. of the outside to $\frac{5}{16}$ in. dia. and part off at $\frac{1}{4}$ in. from the shoulder. Reverse in chuck, turn to contour shown, and file a 3/32 in. slot at each side just above the shoulder, see section.

Chuck a piece of $\frac{5}{16}$ in. rod, face, centre and drill No 31 for $\frac{7}{16}$ in. depth. Turn $\frac{3}{16}$ in. to $\frac{1}{4}$ in. dia. and screw $\frac{1}{4}$ in. $\times$ 40. Part off at $\frac{1}{16}$ in. from the shoulder, rechunk and put a 5/32 in. $\times$ 32 tap through the hole. Screw the piece into the body of the valve.

Chuck a piece of $\frac{1}{2}$ in. rod, face, centre and drill No 21 for $\frac{1}{2}$ in. depth. Turn $\frac{3}{8}$ in. length to $\frac{3}{8}$ in. dia. and part off at $\frac{1}{16}$ in. from shoulder. Reverse

in the chuck, open out to $\frac{5}{16}$ in. depth with a $\frac{7}{32}$ in. drill and tap $\frac{1}{4}$ in. $\times$ 40. Make a gland to suit, from $\frac{3}{8}$ in. hexagon rod.

The pin is a $2\frac{1}{2}$ in. length of $\frac{5}{32}$ in. rustless steel or bronze. Turn one end to a blunt cone point, screw $\frac{5}{32}$ in. $\times$ 32 for a full $\frac{3}{4}$ in. and turn the first few threads away. Cross-drill the other end No 43 and fit a piece of $\frac{3}{32}$ in. silver steel in it. Any length will do, but round off the ends.

Push the valve body through the hole in the soleplate from underneath, and fit the gland in the upper hole, soldering them both; insert the pin and pack the gland with graphited yarn. Open the other hole in the tank top to $\frac{5}{16}$ in. and solder a $\frac{1}{4}$ in. $\times$ 40 tapped bush in it, made from $\frac{3}{8}$ in. rod. The screwed plug is turned from $\frac{3}{8}$ in. hexagon rod and needs no detailing. Put a $\frac{1}{64}$ in. Hallite washer between head and bush.

SPIRIT SUMP

The sump is merely a rectangular tank measuring $1\frac{3}{4}$ in. $\times$ $\frac{3}{4}$ in. and $1\frac{1}{8}$ in. deep, made from 22-gauge metal in the same way as I have described for mechanical lubricator tanks. At $\frac{3}{16}$ in. from the bottom of

one of the narrow sides, drill a $\frac{1}{4}$ in. hole and solder a $1\frac{1}{2}$ in. length of $\frac{1}{4}$ in. tube into it. Solder a piece of $\frac{1}{4}$ in. $\times$ $\frac{1}{16}$ in. angle along each side, level with the upper edge, and file a small slot in the upper edge of one end to serve as an air vent.

The sump is attached to the underside of the soleplate by two 8 BA screws at each side—put through No 43 clearing holes drilled in the angle—into tapped holes in the soleplate. It should be located centrally, with the front end about $\frac{1}{8}$ in. behind the leading axle.

TENDER PUMP

The pump is one of my "standard" type operated by an extension handle through the filling hole in the top of the tank, and as I have only recently described a similar one in detail for testing Zoe's boiler it is a waste of space to repeat the whole ritual. Just follow the instructions already given, but work to the sizes shown in the drawing reproduced here, where they differ from those in the pump mentioned.

There is one difference in the valve box, as the outlet is on top instead of at the side, so instead of fitting the

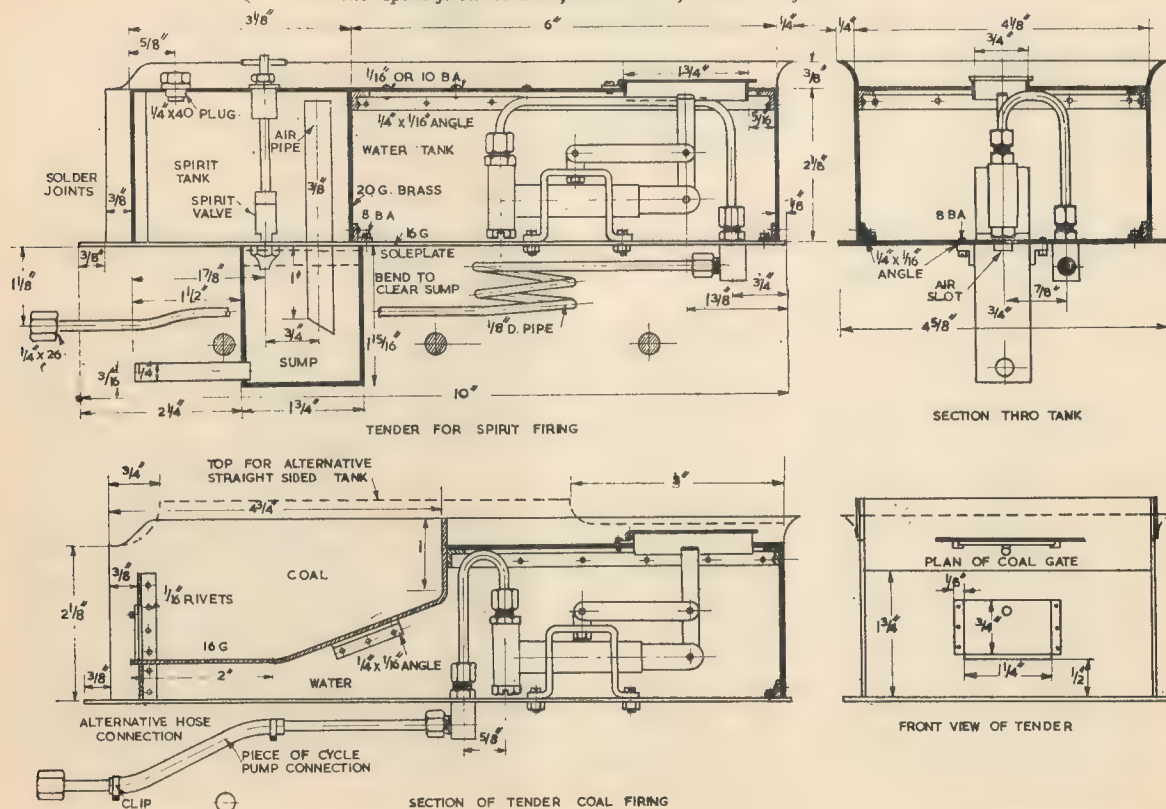
separate cap and nipple, fit the union cap shown.

Chuck a piece of $\frac{3}{8}$ in. hexagon rod in the three-jaw, face, centre deeply and drill to $\frac{3}{8}$ in. depth with a $\frac{3}{32}$ in. drill. Turn $\frac{1}{4}$ in. length to $\frac{1}{4}$ in. dia. and screw $\frac{1}{4}$ in. $\times$ 40. Part off at $\frac{1}{4}$ in. from the shoulder, reverse and rechunk in a tapped bush, and turn down $\frac{5}{32}$ in. length to $\frac{1}{4}$ in. dia., screwing $\frac{1}{4}$ in. $\times$ 40. Cross-nick the end and assemble as shown.

Set the pump lever vertically, then erect the pump in the tank with the centre of the lever $1\frac{3}{8}$ in. from the back, fixing the lugs to the soleplate by $\frac{1}{8}$ in. or 5 BA brass screws. Drill No 30 holes through both lugs and soleplate, and fit nuts to the screws as shown.

At $\frac{7}{8}$ in. to the left of the centre line and $\frac{1}{4}$ in. from the back of the soleplate, drill a $\frac{1}{4}$ in. hole and fit a union elbow in it. To make this, chuck a piece of $\frac{3}{8}$ in. round rod, face, centre deeply, and drill No 40 for $\frac{3}{8}$ in. depth. Turn $\frac{3}{8}$ in. length to $\frac{1}{4}$ in. dia., screw $\frac{1}{4}$ in. $\times$ 40 and part off at $\frac{1}{2}$ in. from the shoulder. At $\frac{3}{16}$ in. from the blind end drill a $\frac{5}{32}$ in. hole breaking into the centre hole, and silver solder a $\frac{1}{4}$ in. $\times$ 40

Sections through the two types of tender; the upper, the spirit-fired version; the lower, the coal-fired



union nipple in it. Push up the screwed end through the hole in the soleplate, and secure it with a $\frac{1}{4}$ in. $\times$ 40 locknut made from $\frac{3}{8}$ in. hexagon rod.

Connect the union on top of the valve box to the union on the elbow by a piece of $\frac{1}{8}$ in. thin-walled tube with a union nut and cone at each end. The pipe connecting the outlet underneath with the union on the engine must be flexible, or the whole lot will come off the road on curves in the line.

To get the length of this, bend a piece of wire into a spiral about $1\frac{1}{2}$ in. dia. with two complete turns as shown, hold it under the soleplate between the middle and trailing axles, cut one end level with the nipple on the elbow union and the other $\frac{3}{4}$ in. ahead of the front beam. Straighten out the wire, cut a piece of $\frac{1}{8}$ in. thin-walled pipe to the same length, fit a $\frac{1}{4}$ in. $\times$ 40 union nut and cone on one end and a $\frac{1}{4}$ in. $\times$ 26 ditto on the other.

When silver soldering on the cones, make the whole length of pipe red hot and quench the lot in the pickle. Wash well in running water, rub up the pipe with a handful of steel wool, and you can then wind the spiral with your fingers around the domestic broom handle without any fear of kinking it. I keep a short length handy for jobs like this!

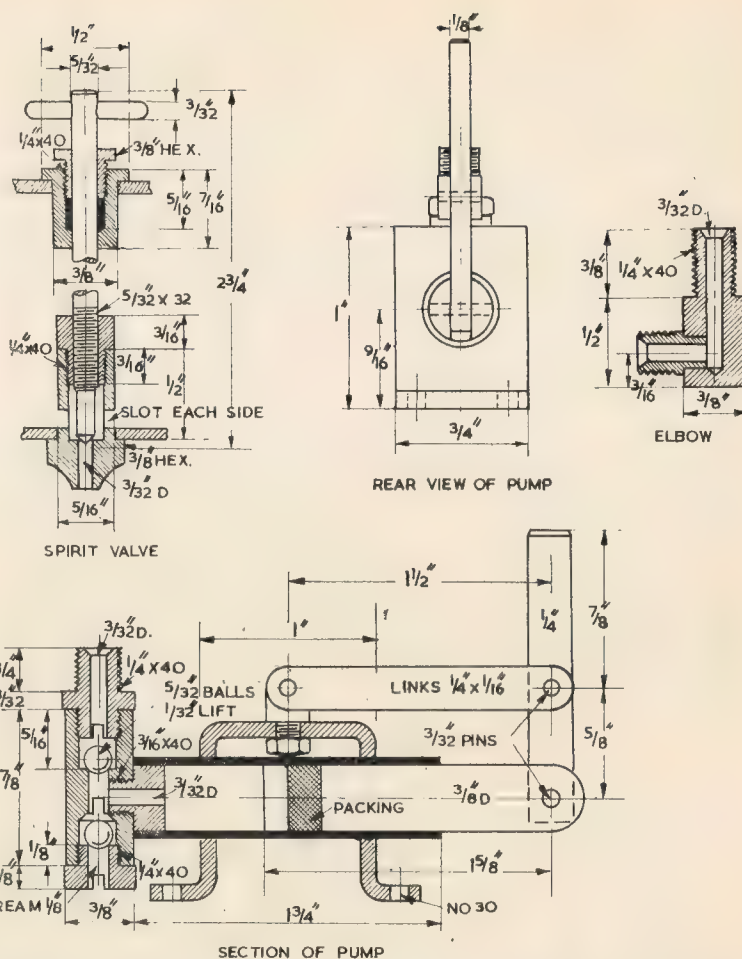
Don't forget to bend the spiral with the $\frac{1}{4}$ in. $\times$ 40 union nut at the shorter end of the pipe; connect this to the elbow union and bend the other end so that it comes centrally and lines up with the union on the engine.

REMOVABLE TANK COVER

Cut a piece of 20-gauge brass to cover the top of the tank. This should be approximately 6 in. long and a full 4 in. wide. At one end, starting at $\frac{1}{16}$ in. from the edge, cut a hole $1\frac{1}{2}$ in. long and $\frac{3}{4}$ in. wide with rounded corners. Bend a $\frac{1}{4}$ in. strip of brass to same shape and solder it in with $\frac{1}{8}$ in. showing at the top. Have the joint in front.

Cut another piece of brass just big enough to overlap the opening and form a lid, but leave two tags. $\frac{1}{8}$ in. wide and about $\frac{5}{16}$ in. long at one end. Bend these into loops with a pair of roundnose pliers. Cut another short strip to fit between them and bend that into a loop at the end. Put a short piece of $\frac{1}{16}$ in. wire through the loops to form the hinge, then attach the strip to the tank top by a small screw as shown. The tank top can then be attached to the angles all round by $\frac{1}{16}$ in. or 10 BA brass screws, roundhead for preference—put through clearing holes in the plate—into tapped holes in the angles at about 1 in. spacing.

A beading of half-round wire can



From left to right, top drawings: Part section through water tank; spirit valve; back view of pump; elbow union. Lower drawings: Front end of tender for coal firing; section of tender pump

be soldered all round the edge of the coping to give a finishing touch to the job, the front ends being extended and bent around a piece of $\frac{3}{32}$ in. silver steel screwed into the soleplate to form a handrail pillar. See general arrangement drawing.

VARIATION FOR COAL FIRING

The sides and back of a tender for the coal-fired version of *Rose* are made and fitted in the same way as I have just described. If a modern straight-sided tender is fancied, leave out the coping and cut the sides as shown by dotted lines. If a piece of metal sufficiently long is available, I recommend making the sides and back in one piece with bent corners, which saves joining separate pieces.

The pieces of angle for supporting the removable tank cover are only

$4\frac{3}{8}$ in. long, but are fitted in the same way; so is the back section. The front plate is made and fitted as before, but is only $1\frac{1}{2}$ in. high, and has an opening $1\frac{1}{2}$ in. $\times$ $\frac{3}{4}$ in. cut at $\frac{1}{2}$ in. from the bottom. A runner is riveted at each side of this to carry the coal gate, see front end view.

The coal plate is made from a piece of 18-gauge or 20-gauge brass $5\frac{1}{2}$ in. long and just wide enough to fit nicely between the sides of the tender. Cut away $\frac{3}{16}$ in. at each side of one end, leaving a $1\frac{1}{2}$ in. tongue in the middle, then bend the plate to the shape shown in the section. Try it in place and mark on each side of the tender the location of the two small pieces of supporting angle shown. On the back of the vertical part of the plate scribe a line level with the side angles.

Continued on page 814

MINIATURE LOCOMOTIVES

FACE HANDICAP TRIALS

The Harrow and Wembley SME efficiency trials proved rather arduous for some of the very many entrants this year

THE annual locomotive efficiency trials of the Harrow and Wembley SME attracted a larger entry this year and, run in good weather, more visitors came along.

Nine locomotives in three gauges attempted the test, which consisted of hauling a load based on the engine's theoretical tractive effort a number of times round the circuit, according to scale, a standing start being made on each lap at the commencement of the gradient.

This type of working trial tests the steaming capacity of the locomotive as well as the skill of the driver, whose aim to conserve coal is often frustrated by the engine's wheels slipping and spinning, and a shower of cinders being thrown out of the chimney.

The larger engines were further handicapped by having the load carried on six trucks which increased the drag on the curves.

Alan Tyler was the first runner with his 5 in. 0-6-0 industrial tank, a locomotive known to modellers up and down the country. Given a load of 1,548 lb., which gave no difficulty, and apart from one occasion when priming occurred and some of the water from the boiler was carried into the cylinders, an uneventful run was made with a coal consumption of 27 oz.

Next we saw Bob Jeffries, the society's chairman, with a powerful 5 in. 0-6-0 GWR tank. Hauling 1,584 lb., this locomotive relied on feeding its boiler by means of injectors only, using steam from the boiler instead of the more usual mechanical pump. This made longer stops necessary and probably accounted for the heavy fuel consumption. A further handicap was the small water tank capacity, which meant that water had to be taken in on the run.

Although the load was well within the capacity of the engine, a fuel consumption of 33 oz. was returned.

The society's locomotive section leader, Fred Cottam, whose GWR King class was a Duke of Edinburgh Trophy winner ran next. His entry was the 5 in. 0-6-0 saddle tank built to his own design and having many original features, including his own system of lubrication. We were impressed by the ease with which this veteran engine tackled its 1,368 lb. load, and in a run without any fireworks the ten laps were completed like clockwork and only 17 oz. of coal was used.

John Richardson's 3½ in. 2-4-0 tender locomotive *Petrolea*, now fitted with a very nice three-note whistle, as always, performed well, but the 432 lb. load was quite hard work for so small an engine, which would normally be used for passenger work in full size, and 8 oz. of coal was used for the seven laps required for this gauge.

The day's running was brought to a close by Dennis Hunt with a 2½ in. gauge 4-4-0 tender engine which was



Reg Uphill working out the formulae and weighing competitors' coal allowance to the nearest half ounce



Fred Cottam evidently finds the full load a serious business while undergoing track trials

given 270 lb. Although this engine had hauled this load previously, earlier runners had polished the rail heads and a strong wind blowing down hill resulted in failure to cover the stiffest portion of the gradient. In another attempt the following week, he was unlucky to have a truck which caused friction on the curves and he retired before completing the run.

The "heavies" were next with Reg Uphill's 0-6-0 dock tank. This type of engine is not troubled by the 1,125 lb. it was given, but the coal supplied did not suit it and several stops were made to recover pressure. As only live steam injectors were used for boiler feed the 16 oz. of coal used was a very good result.

Keith Gardiner followed, driving a 3½ in. gauge 0-6-0 tank, *P. V. Baker*, from the Uphill stable. On the first run, this locomotive was forced to stop when the ashpan dropped and fouled the motion, but this was soon corrected and the re-run with 684 lb. was made on 11 oz. of coal, in spite of one or two stops other than those required by the rules.

The first of the three-cylinder engines followed. Frank Tucker's 4-4-0 SR Schools class, although a passenger type, found the load to its liking and completed the run without difficulty with only a trace of the slipping which is a common fault

Fred, the winner, enjoying firing up



with this cylinder and wheel arrangement. The 612 lb. needed 10 oz. of coal to cover the seven laps.

Another three-cylinder, a 4-6-2 *Hielan' Lassie* driven by Ron Miles, had 720 lb. load to haul, but had bad luck. A blocked blower soon caused difficulty in maintaining pressure and the large firebox needed a lot of filling, so efforts to economise resulted in a bad fire and several stops to regain pressure. However, the run was

successfully completed on 24 oz. of coal.

The results obtained by dividing the load by the weight of coal used gave Fred Cottam a well deserved win with 80 points. Reg Uphill was next with 70 points, and Keith Gardner with 62 points.

The remaining results were: F. Tucker, 61 pts; A. Tyler, 57 pts; J. Richardson, 54 pts; C. Jefferies, 48 pts; and R. Miles, 30 pts. □

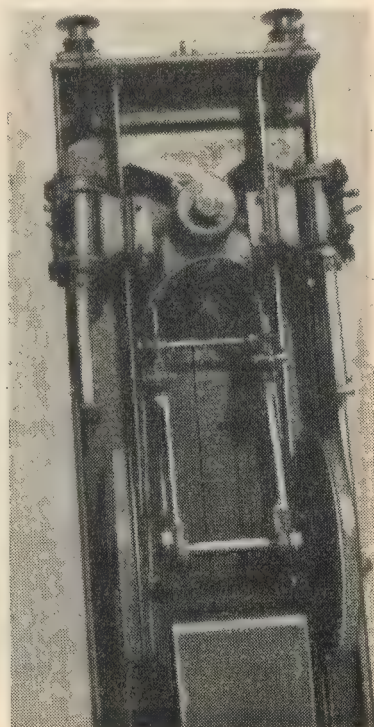
The LNWR Webb Compounds

Following publication of his 4 in. gauge IRON DUKE [30 May 1957] with particulars of the bore and stroke, M. K. Huggard, of Greystones, Co. Wicklow, Eire, submits, for comparison, these pictures of the engine and tender, and the underside of his locomotive.

Working pressure is about 60 p.s.i.



MODEL ENGINEER





Mr R. ING of the IRCMS makes history in the radio control field

RADIO control by a television link was successfully demonstrated during the Enfield Borough Show, London.

One of the features of this annual show is a demonstration by the local group of the Radio Society of Great Britain. This year their display was augmented by a section of the Amateur Television Society who were operating a roving eye camera, which was home built and coupled to a closed circuit system that showed pictures on two 17 in. screens and a small monitor for control purposes.

A few members of the London Group of the International Radio Controlled Models Society were invited to demonstrate on a small artificial lake in the grounds, and a suggestion was made that one of them might try controlling a boat while watching it on a TV screen!

I offered to take part in this experiment with my model of a Thames police launch. This model has been operating under radio control for five years, and is one of the attractions on the water tank at the ME Exhibition each year.

It has a four bank reed system giving four engine controls, two

Bursting the balloon by TV

rudder (progressive steering) and one extra control for special effects. The whole control system operates from eleven Venner silver zinc cells, h.t. for the radio being obtained from a transistor d.c. convertor.

The TV camera was located at the lakeside and, Mr A. Waller agreed to assist in switching on the boats controls and signal that he had done so to the camera. The control transmitter and TV screens were located in a large tent about 25 yards away. When I saw the signal that the boat was alive I switched the motor to slow speed ahead, and the feeling of relief as the craft moved slowly away from the bank was considerable!

The first effect noticed was the lack of perspective. However, this presented no great difficulty with the normal manoeuvres. The boat was returned to the lake side directly into the hands of my assistant in spite of the re-

batteries were also recharged and fingers kept crossed!

For this next run a microphone was placed in the tent so that I could inform the crowds at the lakeside what I intended to do. It was also agreed that I would attempt to perform the well-known gimmick of bursting a balloon.

Came the time for the run and the tent was packed. The first half of the demonstration completed, the boat was returned to my assistant for the necessary preparation for balloon bursting. This entails the clipping on to the bow of two sewing needles, and the hooking of the balloon on to a release device in the stern.

This having been done I took the boat out again and released the balloon as planned, but at this point the wind took a hand, and a chase ensued that ended up at the far side of the lake. However, the



stricted field of view and the cameraman not giving the controller a sight of the bank and boat at the same time which demanded a rapid full astern movement!

This first trial was so successful that it was decided to run a proper demonstration later in the afternoon when the Mayor of Enfield and his guests would be present. Meantime I got together with the cameraman on one or two points to ensure the smoothness of the demonstration,

balloon was retrieved and replaced in the centre of lake and then the matter of perspective really made itself evident. Some five or six attempts had to be made to line up the needles with the balloon before it was finally smitten.

Perspiration was running down my face during this session, but the feeling that a small bit of history in the radio control of models had been successfully accomplished was amply rewarding. ■

In the ME Workshop

EXACTUS concludes his two-part article on the ME multi-flood unit, with instructions on the brackets, arms and lamp mountings

THE two top brackets are fabricated in the same way as the bottom ones, and for the body of the sliding bracket use a piece of 1 in. dia. material $\frac{7}{8}$ in. long. If you have a piece of tube with an inside diameter under $\frac{7}{8}$ in. that will do the job nicely.

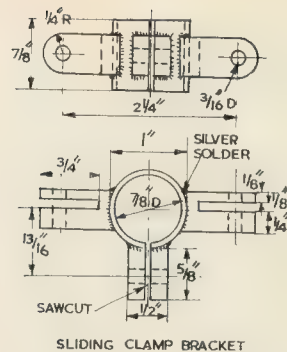
The top bracket is turned from a piece of $\frac{7}{8}$ in. dia. bar to fit $\frac{3}{4}$ in. of its length inside the tube. Should you have intentions of fitting a ball-and-socket head or similar attachment, drill and tap it while still set up in the lathe.

The lugs for the two brackets are cut from $\frac{1}{2}$ in. square material, four $\frac{7}{8}$ in. long and one $\frac{3}{4}$ in. long. File to fit the respective brackets and silver solder, I don't think you should experience any difficulty here; the top bracket has two of the lugs $\frac{7}{8}$ in. long opposite each other and the bottom

one is exactly the same with the addition of the $\frac{3}{8}$ in. one positioned at right-angles to them.

When you have completed this job and cleaned them up, the next stage is the slotting. To allow the arms and stays to move freely the slots are offset $\frac{1}{16}$ in. from the centre. When attaching the two brackets to the column remember the offset must be on opposite sides of the centre line to each other, giving you $\frac{1}{8}$ in. offset. If you don't do this the stays will not move freely. The slot in the short lug ($\frac{3}{4}$ in.) is cut with a hacksaw.

Drill $\frac{3}{16}$ in. holes where illustrated and complete by cleaning up with file and emerycloth. To fit the top bracket press into the tube and drill a No 5 hole $\frac{3}{8}$ in. from the top and tap $\frac{1}{4}$ in. BSF. A special brass pin (shown in the drawing) goes in here. It secures the adapter mounting and also acts as the earth connector.



SLIDING CLAMP BRACKET

The adapter mounting is shaped from a piece of Paxolin or similar insulating material. Use the same kind of material for the locating pins. The heads of these pins form a stop either side of the column, keeping the mounting central and preventing it from turning.

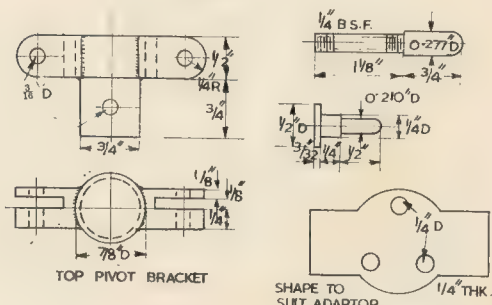
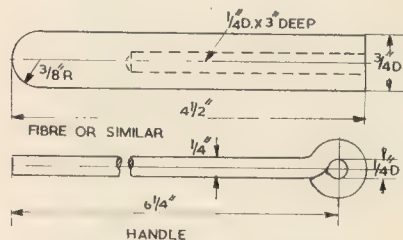
The arms that carry the lamps are two pieces of $\frac{3}{4}$ in. $\times$ $\frac{3}{4}$ in. $\times$ $\frac{1}{8}$ in. dural angle, 12 in. long. This dimension can be lengthened or shortened as desired. Cut away a part of the angle, $\frac{7}{8}$ in. from one end, leaving a $\frac{1}{8}$ in. flat strip that fits into the top bracket.

When drilling the $\frac{3}{16}$ in. hole as dimensioned in the drawing, note that only one is on the centre line. The stays are two pieces of $\frac{1}{8}$ in. $\times$ $\frac{3}{4}$ in. flat strip.

There are two methods you can employ for cutting the slot—one using a $\frac{3}{16}$ in. slot drill in the milling machine, the other by drilling a



Left: Front view of the lamp showing various angles

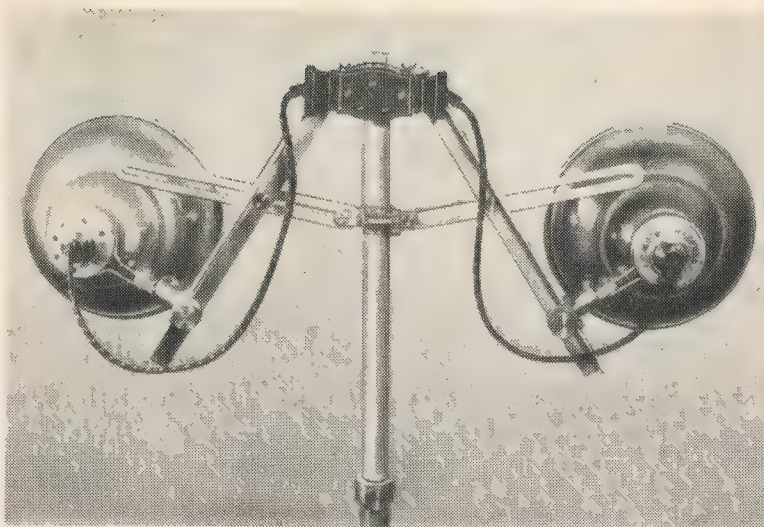


series of No 4 holes so that they just break into each other and finish off with a file.

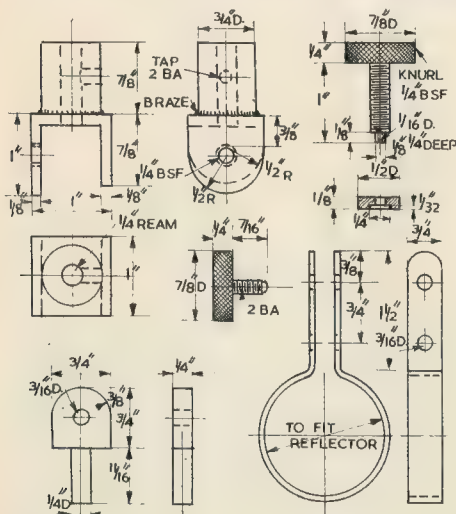
Mark off one strip and clamp them together—no need to waste time doing them separately—then assemble them with 2 BA bolts, making one with a larger head to clamp the stay to the arm. If you made four knurled nuts when you built the legs, use two of them on these screws.

I come now to the last item, the lamp mountings. Two pieces of 1 in. $\times$ 1 in. $\times$ $\frac{1}{8}$ in. channel 1 in. long and two pieces of $\frac{3}{8}$ in. dia. bar are required for the holder. Put the $\frac{3}{8}$ in. dia. bar in the three jaw and drill a letter C-hole right through. Follow up with a $\frac{1}{4}$ in. reamer and finish to length, chamfering both ends—one for appearance, the other to allow a good fillet of silver solder to nestle in.

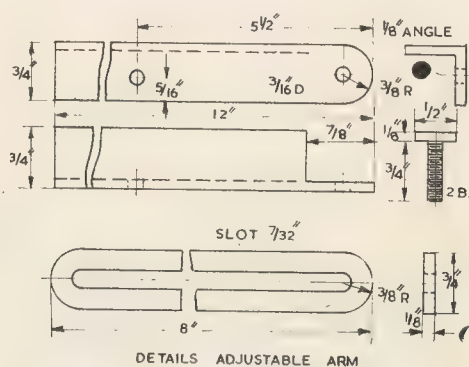
Central with each end, drill a No 26 hole into the $\frac{1}{4}$ in. bore and tap out



Rear view, showing electrical connections



DETAILS OF LAMP HOLDER



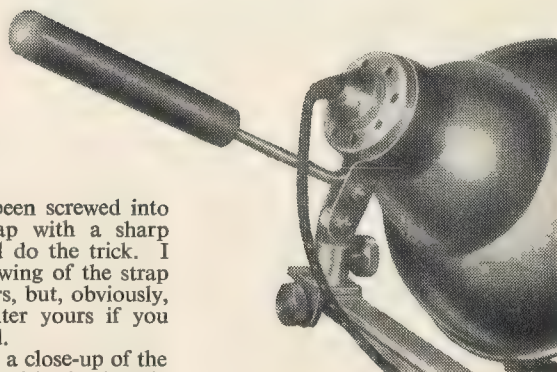
2 BA. Now mount each one on a piece of channel and silver solder. When it has cooled off shape up the channel as shown in the drawing and drill one hole with a No 5 drill and tap $\frac{1}{4}$ in. BSF.

From a piece of $\frac{1}{4}$ in. $\times$ $\frac{3}{8}$ in. bar cut two pieces $1\frac{1}{8}$ in. long for the swivel part of the holder. Grip them in the four-jaw and turn a $\frac{1}{4}$ in. dia at one end, $\frac{11}{16}$ in. long. Mark off the other end for a $\frac{3}{16}$ in. hole and radius off to make it look neat. The locking screws are turned from a piece of $\frac{7}{8}$ in. dia. bar—two with a 2 BA thread and two a $\frac{1}{4}$ in. BSF.

Attached to the end of the $\frac{1}{4}$ in. BSF locking screws is a small pad made from $\frac{1}{2}$ in. dia. material. This is secured by riveting over the small

spigot after it has been screwed into the channel. A tap with a sharp centre punch should do the trick. I have included a drawing of the strap that fits our reflectors, but, obviously, you will have to alter yours if you have a different kind.

In Fig. 4 you have a close-up of the swivel lamp holder with the handle that was added later. The plastic material used was $\frac{3}{8}$ in. dia. Catalin, red in colour. It is obtainable in a variety of colours and sizes, and it certainly gives this little job its finishing touch. ■



Above, Fig. 4: Close-up of the swivel lamp holder with handle

POSTBAG

The Editor welcomes letters for these columns, but they must be brief. Photographs are invited which illustrate points of interest raised by the writer

AT HIS ELBOW

SIR,—Thank you for the two book vouchers. It came as a great surprise to get the first one, but to get a second one as well completely overwhelmed me!

As a maintenance engineer in the local newspaper office, MODEL ENGINEER has given me tips of the utmost value and I have found that a couple of hours browsing through the back numbers have often led me on the right lines for a particular job.

One of the most useful things I have made was the twist drill grinding jig, and a fairly recent piece of usefulness was the electronic stroboscope which was wired up by our teleprinter mechanic, while I made all the neces-

A change is certainly as good as a rest. More power to Percival Marshall Ltd for such good publications. Having had ME for the last 20 years, I hope that *Home Mechanics* will be at my elbow for the next 20 years as a companion to the other.

I must say that I enjoyed the ME Exhibition very much indeed, so much so that for the second year in succession I have taken an apprentice of mine and this year, my daughter as well. The daughter should really have been a boy, but these things will happen. Although I have never shown or entered any models myself I really get great pleasure in looking at pieces of work carried out by others.

Swindon, Wilts.

F. C. PEARCE.

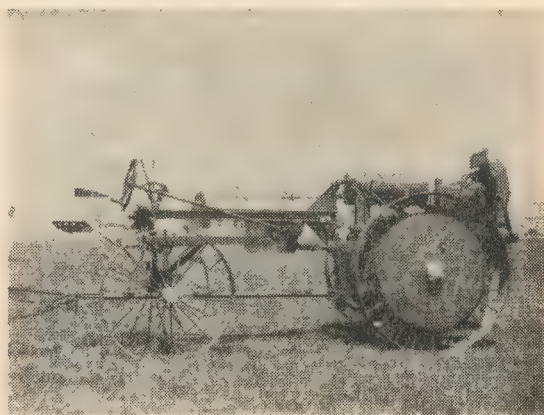
as they are with the imprint of his most exquisite workmanship.

One of the old marine engineers has passed away to whom the sound of a whiff of escaping steam and the smell of hot oil were as the breath of life. Some of us will sorely miss him. near Bridgwater, W. R. ARMSTRONG, Somerset.

ANCIENT TRACTORS

SIR,—I am enclosing snaps of two ancient American tractors which took part in the Southland centennial celebrations at Invercargill and which I think may interest you.

Both machines were in full working order and still pulling their weight on their respective farms.



Left: Tractor No 17364 by the Avery Co., of Peoria, Ill. Right: Moline Universal tractor bearing chassis No 19337.

sary bits, blobs and gadgets. I am sure that these are of much more value than we paid for the pieces, as the stroboscope alone came to only £10 and it solved several problems which would have cost the firm much more than that in repair bills.

Home Mechanics, too, has had its full share of attention and the "know how" gleaned from those copies has been of real use, as well as the enjoyment derived in trying to solve Mr R. du F. Edwards' crossword puzzles. I have found the relaxation afforded by the crosswords has been very useful in getting the mind off the everyday worries involved in some sticky maintenance problems.

WILL BE SADLY MISSED

SIR,—I read with sorrow in MODEL ENGINEER of the death of Commr W. T. Barker, RN.

I have known him for a long time and we used to meet once a year at the Exhibition and talk marine engines.

I have a duplicate of one of his triples in an advanced state, and during its erection he has given me every kind of kindly encouragement and tips galore.

His historical collection of marine engines, from the lovely side lever job up to his latest triples, are to me examples of poetry in metal, blessed

The large disc in the Moline tractor wheel is thick cement concrete, the added weight having evidently been found necessary.

Picton,
New Zealand.

J. E. ROBINSON.

SUPPLIES IMPROVING

SIR,—I have been a regular reader of MODEL ENGINEER since I started to serve my time at Parsons Southampton in 1942 and I look forward to receiving my copy every Wednesday, even though it is a few weeks old when it arrives here.

I bought my lathe, a 3½ in. Grayson, at the end of the war and brought it

out here with me; and it has been worth its weight in gold.

Model engineering tools and supplies are becoming easier to obtain now as the place develops, but it still leaves a lot to be made in the home workshop. Castings are practically unobtainable, so is small hexagon steel or brass rod. However, shortages of this kind really only encourage initiative on the part of the model engineer.

At present I am building a vertical slide for my Grayson lathe, a free-lance job, but it should prove very useful.

I must congratulate you on the way you keep up such a high standard in MODEL ENGINEER, with plenty of steam work in evidence and good old LBSC.

Townsville,
Queensland.

JOHN W. OSGOOD.

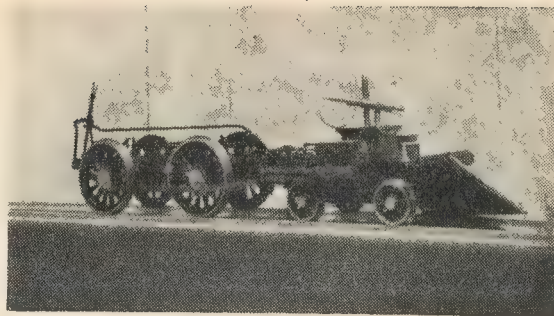
ANY OTHER BUSINESS

SIR,—With *Zoe* approaching completion, thought is doubtless being given to LBSC's next series. I would like to suggest that a few items of unfinished business be taken care of first. For example, in 1932-33 LBSC described a LNWR 2-4-0 *Sister Dora*. As described, a Joy valve gear was used, but in the course of the series, LBSC made some mention of scheming out an Allan straight link. Has this ever been published? If not, why not now?

A couple of years ago, LBSC stated that he could give a satisfactory boiler for *Puffing Billy*. This has not appeared. I think this would be interesting.

For the next engine, I would like

The stage that Mr Jack Kulish has reached after six months' work on LBSC's VIRGINIA



to suggest the following for consideration: Mallet—the N and W *Anabelle* which LBSC has built; Garratt—East African Railways 59 class, built to $\frac{3}{4}$ in. scale for 2 $\frac{1}{2}$ in. gauge; and a Midland compound 4-4-0 for 3 $\frac{1}{2}$ in. gauge.

E.W.W. [Readers' Queries, July 4] asks for information on a reversing valve gear for Sir Morris de Cowley.

If he will refer to *English Mechanics* (now a Percival Marshall publication) for 11 and 18 September 1931, he will find that LBSC has given a Baker gear for *Small Bass*. I recall that he also described a Stephenson link for *Small Bass*, but cannot recall the issue. I believe that it used a simple round pin for the die block, a construction which, in more recent years, LBSC has found unsatisfactory.

Pennsylvania, FRANK H. MOORE.
USA.

SIX MONTHS' LABOUR

SIR,—My snapshot shows six months' work on LBSC's *Virginia* in 1 in. scale. I made the patterns and

did all the castings. Wheels and cylinders are cast iron; drivers are 5 in. dia. and cylinders 1 $\frac{3}{8}$ in. $\times$ 1 $\frac{3}{8}$ in.

Stanford,
Mont., USA.

JACK KULISH.

STEAM CARS

SIR,—In the series of articles on steam cars I am surprised to find that the basic specification for a road vehicle has never been stated.

Assuming what is required is a small family car, the equivalent of the Austin A35 or Morris Minor 1000, this should be as follows: unladen weight not exceeding one ton; high rate of acceleration from standing start to prevent obstructing other traffic and to back out of trouble in traffic; maximum speed limited to 50 m.p.h.; instantaneous response to the throttle; and fuel consumption cost equivalent to not more than 50 m.p.g. at premium grade petrol prices.

Of these conditions what does the steam engine comply?

The flat power curve, almost constant torque over speed range, will give high acceleration with a limited top speed.

Flash boilers are out because they cannot answer the throttle without a dangerous time lag. As they contain very little water and no steam storage space the throttle must control the fuel, air and water feed with the engine having no separate steam control. This means that, with the very wide difference in fuel flow rate between idling and full power, the vaporising burner must be replaced by an atomiser more on the lines of a conventional i.c. carburettor bit with controlled fuel feed.

For economy the firebox must be pressurised, and as for starting from cold, the water, air and fuel feed unit must be an auxiliary electrical unit. Now there comes a glimmer of light of the path on which steam prime mover may have a faint chance of success.

I suggest a constant speed De-Laval type turbine, direct coupled to a d.c.

ROSE . . . continued from page 806

Remove the plate and rivet a piece of angle to the back of it flush with the marked line, but stopping short at $\frac{1}{4}$ in. from each end. Rivet the two supporting angles to the inside of the tender side sheets as shown, allowing for the thickness of the plate. Then put the plate in place with the tongue at the front through the coal-gate opening, and solder it all round to make it watertight.

The pump is erected in the tank as previously described, but the union elbow is fitted in a $\frac{1}{4}$ in. hole drilled in the soleplate $\frac{1}{8}$ in. ahead of the valve box and $\frac{3}{4}$ in. to the left of the centre line. Connect the two with a swan-neck of $\frac{1}{8}$ in. tube with union nuts and cones at each end.

The tank top and filler are made and fitted in the same way as previously described, the only difference being that this one is only 4 $\frac{1}{2}$ in. long. The

connection between the elbow union and the one on the engine can be made as before, with a $\frac{1}{8}$ in. pipe having two spiral coils in it, or by the alternative shown.

Instead of one coiled pipe, use two short pieces, one with a $\frac{1}{4}$ in. $\times$ 40 union coupled to the elbow, and the other with a $\frac{1}{4}$ in. $\times$ 26 union to suit the nipple on the engine. Connect the two pieces with a short length of the hose used for cycle-pump connectors. This will stand the pressure required to force the water into the boiler. To prevent it blowing off the copper pipes, fix it with two miniature circlips made from thin brass about 24-gauge, and secured with $\frac{1}{16}$ in. or 10 BA screws and nuts.

Tail-note—I haven't forgotten the grate and ashpan; look out for these in the next instalment!

● To be continued

POSTBAG . . .

generator with a flash boiler at 1,000 p.s.i. at high superheat with pressurised firebox. Using modern super-storage batteries it might even be possible to drive while the engine was warming up. The driving controls would be purely electrical and the generator output could be controlled by the voltage drop across some convenient part of the circuit.

Most steam fans think paraffin is the ideal fuel, but at 4s. 8½d. it is only a ¼d. cheaper than premium petrol and 5½d. dearer than commercial petrol or vehicle gas oil. Surely the research should be into using cheaper, and preferably indigenous, fuels, remembering that there is always 2s. 6d. per gallon excise duty on all vehicle fuels.

Academically there may be some points where a steam plant is a better unit for a vehicle than petrol but until we can bottle power from outer space or build midget direct electricity producing reactors, the piston i.e. engine is going to have no rival for economy, reliability and simplicity of operation.

East Ham, E.6.
A. E. CLAUSON.

SIR,—No doubt the points raised by Charles E. Hooker [Postbag, November 14] on the Claydon steam car will be answered by Mr Claydon himself, but I must question the statement: "And why use 30 watts for the blower, when a self induced draught can be satisfactory." Thirty watts is quite low for a centrifugal fan when used for this duty.

What I would like to know is: How can an atomising oil burner be expected to function in a completely enclosed combustion chamber, without forced draught?

This type of oil burner is the only one which can be automatically controlled to the precise limits necessary in a modern steam car.

If your correspondent is referring to the vaporising burner, as used in the Stanley White and other steam cars, I would point out that I am convinced that this type of burner is as dead as the dodo as far as a modern steam car is concerned. Portsmouth.
ROBERT G. DAVIS.

THAT CONSTANT!

SIR,—About this boat business; scale speeds and what not. First of all let's scrap the expression "scale speed." Ever since old Froude sorted things out on the river Dart, "corresponding speed" has been the term used in the best circles. And there is no doubt that there are corresponding

speeds for all sizes of models built to the same lines.

Now this can be proved by wranglers without going near the water, which should keep the No 8 hats happy. Of course, the model must be a model; but everything from high speed (flying boat hulls) to low (dumb barges) obeys the rule, and the rule is so simple:

$$\frac{V}{\sqrt{L}} = \text{Constant}$$

V is the speed in knots, and L is the water line length in feet. Constant is the same for ship and model.

Mr Westbury, you've sniffed salt water, you know all this, you can do a bit of simple arithmetic. Please tell 'em all how simple it is. This rule takes care of all except frictional resistance and, in our sizes of models, that can be ignored. By the simplest little sum it becomes obvious that the right speed for a model is the full-size speed times $\sqrt{L}$ scale.

"Makes the same sort of waves" is the answer. How often do we see, on the ponds, the over-driven coal barge effect produced by distorted hull dimensions and incorrect speeds? Alas our MPBA competitions take no note of sea conditions, and our judges have forgotten their weighing machines and their V 's and the square root of L . (What an idea for Nomination:

$\frac{V}{\sqrt{L}} = K$ and the nearest man wins!)
New Barnet, D. G. GORDON.
Herts.

LIFEJACKETS

SIR,—At the risk of pedantry, may we point out an error in the article on *St Ninian* [p. 473, October 3].

All vessels plying in British waters, with very few exceptions, have to comply with rigid Ministry of Transport regulations. There is now no such thing as a lifebelt. The item to which your author refers is a lifebuoy; these are to be found on ships, docksides and wharves.

A full specification can be obtained from the MOT but for modelling purposes, those given are adequate. The grab-line is secured by four equidistant seizings, 3 in. wide, and must be at least 52 in. between each band. Two buoys are carried, one each side, on the extremities of the bridge in inclined ramps, so arranged that the release of a wedge permits them to drop into the sea, and this, together with the light attached to the lanyard, enables a surer and quicker way of finding the unfortunate and involuntary swimmer.

The appliances stored in the lockers, on the other hand, are *lifejackets*, and are placed over the head and secured under the arms and across the chest.

Should any of your readers wish for still further details of these appliances, I shall be most pleased to help them in any way. I naturally look for these details first, and have been surprised at the number of models which carry very odd misrepresentations of our products.

Fosbery and Co. Ltd., J. J. EALES.
(Marine life-saving appliances),
Barking, Essex.

Edward Bowness replies: I appreciate very much the interest taken by the writer of this letter in pointing out my error in describing a lifebuoy as a lifebelt. All my life I have thought of them as lifebelts but on looking up the "Admiralty Manual" and other reference books lifebuoy is the usual term,



The lifejacket, distinct from the lifebuoy

although occasionally the word lifebelt is used. With regard to the lockers, the builder's drawing named these *Lifebelt Lockers*. However, lifebelt may be an alternative designation for a lifejacket. I agree that lifejackets are more likely to be stored in lockers than lifebuoys; also that lifebuoy is a much more suitable word than lifebelt.—EDITOR.

MICROSCOPICALLY SPEAKING

SIR,—A long time ago I described the construction of a steam engine, the boiler of which was machined from the solid. This brilliant idea brought howls of derision from the more ignorant of your readers, but now I see that Mr. A. A. Sherwood has followed my example in his 000 gauge locomotive, with rather more success than I had, I must admit.

You might like to know that I have recently completed an 0000 gauge live steamer. The boiler is so small that special scale water has to be used, the ordinary sort is too big to go through the filler. It burns coal dust, one at a time, and the smokebox and steam pipes were made by electro-plating a small spider in crouching posture.

Unfortunately, while I was running it up the passage Auntie came in and trod on it, thinking it was some sort of steaming beetle, so I am unable to send further particulars. I am now using it as a printed circuit in some radio-control experiments.
London, W.13. MICHAEL OXLEY.

SUPPORT FOR MR MELTON

SIR,—I would like to support Mr J. Melton in his plea for "homework" jobs; in fact, in Club News, Mr J. Latta supports it with his remarks on ME widows.

I think there must be many readers in my position, with only handtools for metalwork, who can only read of turning in metal but who could "farm out" the turning of one or two parts and do the handwork themselves.

My own hobby is in wood, as well as my trade, but making my own tools entails metalwork in various forms. Details of one, "An Improvised Sander," was published some months ago and my latest is a sawtable to fit my wood lathe, patterns for all

James Melton's plea, in our issue of October 24, for articles on the construction of domestic machinery seems to have aroused mixed feelings. Here is a selection of the replies from our readers

being complete and part of the casting done. All operations except one can be done by hand on bench tools.

I do my own patternmaking, moulding and casting. The odd machine work will be done outside.

I am only giving these details to point out that there are people who read and understand models but who do not wish to build them, who would welcome something useful.

Warter, York.

E. RUDD.

NO PLACE IN ME

SIR,—I entirely disagree with Mr Melton's suggestions that constructive articles on such things as sewing machines, washing machines, lawnmowers, etc., should be included in MODEL ENGINEER. These things, though very useful have nothing to do with model engineering. If he wants to obtain gen on such matters let him look elsewhere.

I am a ship modeller and I was disappointed when *Ships and Ship*

Models ceased publication. I now take ME, it being the next best as far as authentic information, and keeping in touch with the various activities is concerned. So I repeat this is MODEL ENGINEER and the above articles have no place in the magazine.

Leicester.

J. A. THOMPSON.

NO, SIR!

SIR,—Allow me to state my adverse reaction to Mr Melton's suggestion. The very name MODEL ENGINEER would seem to preclude such subjects as auto repair or the construction of household machinery. It seems to me that the inclusion of such topics would take up space that might better be employed for articles on modelling. Sierra Madre, Calif. USA.

CLARK MARSHALL.

HERE'S TO PURE ME . . .

SIR,—As a subscriber to ME from No 1 to the present day, may I express the earnest hope that you will not accede to Mr James Melton's request for designs for, and descriptions of, home equipment.

There are in existence already numerous periodicals and extensive literature dealing with this subject, including your own publication *Home Mechanics*, and I can see no justification whatever for its intrusion into the columns of ME.

One of the most delightful features of model engineering is that, apart from providing a livelihood for a small group of professionals it has no direct utilitarian purpose whatever; it is a pure and delightful hobby, and long may it so continue.

There used to be a toast at one of our major universities which ran: "Here's to pure mathematics and may it never be any damn use to anybody"—a sentiment the general principles of which I think apply to the attitude of the great majority of model engineers to their hobby.

Most model engineers get roped into all sorts of household repairs and construction, and most of them regard these intrusions upon their model engineering activities with a jaundiced eye.

People who desire to utilise their workshops and their handicraft skills for utilitarian purposes, are perfectly at liberty so to do; they are no doubt admirable citizens, domestic paragons, fond of children and kind to cats, but they are *not* model engineers, and as I said before, they are already quite lavishly catered for.

It would be a great pity if the one journal that for nearly 60 years

has catered primarily for model engineers, should become cluttered up with designs for self-filling coal scuttles, fountain pens which will write on both sides of the paper at once, automatic bedmakers, and all the thousand and one allegedly utilitarian gadgets that appeal to the pedestrian and unimaginative minds of folk whose approach to everything, including model engineering, is, "What use is it?"

What use is a rose, or for that matter, a new-born baby? For heaven's sake keep the ME for model engineers.

Rustington, Sussex.

K. N. HARRIS.

NEW LOOK SPOILED IT

SIR,—I have read with considerable interest Mr James Melton's letter.

How right he is—I am sure there must be a huge number of readers who would prefer to make something useful—something that does something—instead of models.

I implore all readers who feel this way to write to the Editor and express their wish. Only in this way can the Editor appreciate how and where ME is failing us. The more who write, the more convinced will the Editor be.

My own personal feelings are that MODEL ENGINEER deteriorated very considerably from the time it introduced the "New Look" approximately a couple of years ago. It used to have excellent articles on workshop equipment, tools, workshop topics and interesting things to make, giving at the same time adequate space to the modellers. Now I fear the age for which it caters is in the "teens."

Mr Editor, please revert to the type of magazine we enjoyed so much five, six and seven years ago.

Hessle,

E. Yorks.

H. J. MARCOLYN.

GAVE HIM ENJOYMENT

SIR,—Mr James Melton's letter interested me, for I can certainly see some value in his suggestion even if many model engineers throw up their hands in horror.

But what of another aspect which MODEL ENGINEER seems to have neglected? What has happened to these interesting articles on the world's railways and engineering feats which did so much to leaven the pages of ME?

I, for one, enjoyed them immensely, and judging by the lively correspondence some of them aroused, I am sure others did.

London, N1.

L. C. CHARLES.

READERS' QUERIES

Do not forget the query coupon
on the last page of this issue

This free advice service is open to all readers. Queries must be on subjects within the scope of this journal. The replies published are extracts from fuller replies sent through the post; queries must not be sent with any other communications; valuations of models, or advice on selling, cannot be given; stamped addressed envelope and query coupon with each query. Mark envelope "Query," Model Engineer, 19-20, Noel Street, London, W.1.

Carbon arc welding

What is the secondary output of the transformers used for what I believe is known as carbon arc welding? These transformers may be plugged into an ordinary power point in the normal domestic supply, being rated at 230-250 v., 15 amp. Would a transformer of this type, rated at 230-250 v., 10 amp., be satisfactory for this type of welding?—C.A.B., Billericay, Essex.

▲ The voltage is generally fairly low—not more than 6—and the output may be 500 amp. or more.

With reference to the transformer you specify, rated at 230-250 v., 10 amp., this is presumably the input and with such a transformer you might be able to obtain about 300 amp. output at 6 v., which would be sufficient for some classes of work.

You are probably aware that these transformers do not actually produce sufficiently high output for true arc welding. The carbon electrode is used as a heating resistance to produce an extremely high local temperature, but not sufficiently high for steel welding. For arc welding a voltage of not less than 35-50 is necessary and the current also would have to be correspondingly high.

Bending exhaust

I am making an exhaust pipe and silencer for a 6 c.c. Stentor petrol engine fitted in a 36 in. launch. I need to bend the exhaust pipe through 90 deg. at a radius of about $1\frac{1}{2}$ in. between the exhaust port and the Burgess-type silencer. The exhaust pipe is of copper and I was advised that in order to bend it I must heat it but not in direct contact with a flame.

My equipment is of the simplest, and I would be grateful for your advice on how to bend the pipe.—A.L.A., Bushey, Herts.

▲ You do not state the size or gauge of the tube, but this will influence the difficulty of bending it and, if it is rather thin in relation to diameter, it may be found necessary to load the pipe with a suitable bending alloy.

It is not understood why you have been instructed to heat it but without direct contact with a flame. Copper is usually annealed by heating with a blowlamp, or other convenient source

of heat, to a dull red and then quenched out in water. There are several appliances available for bending small pipes. One of the best known is the Kennedy bending jig, but if you do not wish to go to the expense of obtaining such an appliance make up a pulley of the required size with a grooved rim to fit the pipe; this will very much assist in bending it without distortion.

An article entitled "A Miniature Tube Bender" by C. Horace Clark appeared in MODEL ENGINEER of 22 March 1956.

Processing stainless steel

I shall be grateful if you could kindly advise on the processing of hardening stainless steel, and the type of stainless steel best suited for making surgical instruments.—G.G., Port-Louis, Mauritius.

▲ There are many varieties of stainless steel, some of which are not suitable for hardening, while others require special treatment. Where possible the makers of the particular steel should be consulted on this matter.

A type of stainless steel which is well suited for surgical instruments is Non Stain No 4379, manufactured by Messrs Sanderson Bros and Newbould Ltd, of Sheffield.

The hardening of this material requires a temperature of 960-980 deg. Centigrade, after which the article is cooled in an air blast or by oil quenching, giving a Brinell number of 477-514. Tempering requires a heat of 200 deg. Centigrade for a period of 30 minutes.

Traction engine wheels

I am rebuilding a small freelance Burrell type traction engine, the rear wheels of which are $5\frac{1}{2}$ in. dia.

Could you please tell me what width and thickness the T-rings should be for this size, and also the thickness and width of the spokes?

Can you enlighten me also on the method of attaching the belly tank. Should it be fastened to the boiler or the firebox?—C.L., Coulsdon, Surrey.

▲ A traction engine hind wheel of $5\frac{1}{2}$ in. dia. would be proportioned as follows: 16 spokes, width $\frac{3}{16}$ in. $\times$ 18 s.w.g. (could be made $\frac{1}{8}$ in. for greater strength) width at rim end about $\frac{3}{16}$ in. for riveting to T-rings. The T-rings would be $\frac{1}{8}$ in. wide $\times$ $11/32$ in. deep, and about $\frac{1}{8}$ in. thick, the

middle section being $5/64$ in. thick. Thus the total width of wheel would be $1\frac{1}{8}$ in.

Road strakes would be about $\frac{5}{16}$ in. wide $\times$ 18 s.w.g. thick, with gaps between about $9/32$ in. Belly tanks are bolted to the boiler just in front of the hind wheels by means of a flange each side, following the curvature of the boiler.

Under-water treatment

I am engaged on a model of a West Country trading ketch, from Mr H. A. Underhill's plan, and I would appreciate advice on the finish of the below waterline portion of the hull.—D.A.T., Newport, Mon.

▲ The under-water body of a West Country trading ketch was invariably treated with tar. You would be quite correct to paint it black on your model but a very smooth finish is neither necessary nor characteristic.

Water gauge surges

I am having some trouble with the water gauge of my Shay locomotive. When the regulator is open the water surges in the glass and when the regulator is closed the water goes below the bottom nut of the gauge.

The gauge is an American type with a water column of $\frac{3}{8}$ in. copper tube and is bolted to the backplate at the bottom and connected by a $\frac{3}{16}$ in. dia. pipe to the boiler which it enters $1\frac{1}{2}$ in. from the centre line.

All the waterways, including the connecting pipe and the gauge glass, are $\frac{1}{8}$ in. bore and are quite clear of any deposit or other obstruction.—E.C., Hitchin, Herts.

▲ The cause of the trouble is the fact that the pipe leading into the top of the column is of small bore and is very much longer than the "way in" for the water direct to both column and gauge proper. A cure could be effected if the bore of the way between boiler and column were at least doubled and the length of top and bottom ways made equal. Alternatively, an elbow fitting on the topside of the boiler could be used instead of the column.

Refrigerator components

Components for refrigerators, referred to in a recent query, may also be obtained from Messrs Wheelhouse, 13 Bell Road, Hounslow, Middx.



Close-up of the Aveling and Porter 12136 cylinder block



The roller's nearside wheel and scrapers



The steering-train attachment showing an extra large link

12 DECEMBER 1957

LET'S HAVE A CLOSER LOOK

H. H. NICHOLLS asserts that model engineers often "caricature" details when modelling traction engines and rollers. So in order to help you avoid these pitfalls he offers these close-ups of a full-size Aveling and Porter roller clearly showing details of fittings



The scarifier and attachment, offside wheel and feed pump



The steering worm and chain



The chimney base and lamp iron

CLUB NEWS

Edited by
THE CLUBMAN

WH O would like to win a Wallace and Stevens traction engine worth at least £200? This is an offer made by the National Traction Engine Club which has raised large sums for charity and is now, by an irony, in low finances since the cancellation of the Abingdon Rally owing to bad weather.

Many MODEL ENGINEER readers are grateful to the club and will be keen to do their bit towards helping it—with the chance of winning this remarkable prize. John Crawley, of 51 Putnoe Lane, Bedford, has all the particulars and plenty of tickets at five shillings each.

I am sorry to add that the Rev. Philip Wright, Vicar of Woodford Green, in Essex, and the new chairman of the NTEC in succession to Ronald Deamer, is suffering from an old injury and may have to enter hospital again. Every reader knows of Mr Wright through his models and drawings of windmills. He has sketched 126 windmills, most of them now derelict, and his models have been shown on television, together with farming implements from the collection which he has been making since boyhood.

All Mr Wright's model engineering interests can be traced to his earlier life in the countryside. While farming for nine years in Suffolk he used steam engines: hence the great work which he has done towards preserving them. He serves the East Anglian club as PRO and for some time has been a committee member of the national club. Somehow, too, he finds time to be a member of the Territorial Army, to which he has belonged since he was demobilised twelve years ago. It says much for his enthusiasm and energy that he has been able to carry out these duties while looking after a parish of six-thousand souls.

All readers of this page will join me in wishing Mr Wright a full recovery well in time for a comfortable Christmas. As for the club which he leads, the NTEC can best be helped by the immediate support of the

individual. The new secretary is Harold Bonnett of 24 Torrington Road, Perivale, Middlesex, and the treasurer is E. W. Edney of 33 Portsmouth Road, Horndean, Hampshire. Mr Bonnett will be assisted by Charles Durrant.

OO LAYOUT SUCCESS

One of the attractions which helped to make a great success of the annual exhibition held by Northolt MRC was the club's OO gauge layout outside the main building. The exhibition had the support of the Norwood, West Wickham and Orpington model railway clubs and of the Narrow Gauge, Festiniog and Talylyn railway societies; and for this the Northolt men are, of course, grateful.

When secretary J. Matthews (180 Chaplin Road, Wembley, Middlesex) wrote to me, the winter season had begun and the rebuilding of the main stud contact terminus was nearly completed. Preparations were being made for re-laying a good deal more of the stud contact track; the branch line, in the capable charge of K. Brown, was close to being finished; and the two-rail layout needed only the completion of the terminus before work turned from the track to the scenery. The TT and EM sections were also doing well, the TT having begun a working layout and the EM having some track down on the two-rail baseboards. Although the TT is a new section it already has "quite a few" followers.

The club president is now building gauge 1 locomotives, and the club hopes to construct before long a small outdoor layout in this gauge. Any reader in the area who is interested in gauge 1 has a special invitation to pay the club a visit—at Northolt Village Community Centre, Northolt, Middlesex.

LEICESTER SHOWS HOW

In the Midlands, Leicester SME has seen important changes during the year, both in new members elected as officers and in new policies which have been applied to the running of the club. At the annual meeting on December 18 secretary B. H. Newman (1 Overseal Road, New Parks Estate, Leicester) should be able to report one of the most successful years for a long time.

Once again, in the seventh running season, the multi-gauge miniature railway at the Abbey Park has proved

a big attraction to members and public alike. The latest addition to the locomotives is W. Nuttings' 5 in. gauge 0-6-0 *Minx* which already promises to perform well.

How many clubs hold driving classes to ensure a good standard of driving among the members, and especially the new ones? Using the club's own engine, a 5 in. 0-4-2 saddle tank, Leicester introduced this idea during the year with such success that it will be continued in 1958. The instruction is given by experienced drivers.

Discussion evenings, model nights, film and lectures occupy the meetings held now at the Belgrave Road Methodist Church Rooms. Talks are given by members, and recently the society had the pleasure of listen-

ME DIARY

December 12 Hull SME, Best Model of the Year Exhibition.

Huddersfield SME, annual dinner, Heywood's Cafe, Market Street, Huddersfield, 7.30 p.m.

December 13 Malden SME, rummage sale.

Warrington MES, "Extrusion of Non-ferrous Metals," illustrated talk. Thames Shiplovers, "The United States Coast Guard," Capt. Donald T. Adams, USCG.

December 14 Glasgow SME, film show, R. Kerr of Kirkintilloch, SMC.

Railway Enthusiasts' Club, colour-slide show, R. C. Riley.

SMEE annual meeting, 14 Rochester Row, Westminster, 2.30 p.m.

December 17 Hastings and District MES, Surprise Night (anything can happen).

December 18 Bristol SMEE, film show in light vein, Folk House, 7.30 p.m.

Leicester SME, annual meeting.

December 20 Malden SME, "Model Loco Building: Choice and Cost." Birmingham Ship Model Society, "Ship lines and Plans for Modellers," A. E. Field.

Warrington MES, Christmas gathering, Royal Oak, Bridge Street, Warrington.

ing to lecturers from the City Police and from Leicester Astronomical Society. These lectures suggest the width of interest in this member club of the West Midland Federation. Here we have a society which likes to adventure with new ideas and new talent and is, in consequence, reaping due reward.

YORKS TOUR

Pepped up by plenty of Yorkshire air (and pudding?) Edgar T. Westbury has returned from a tour on which he met a number of model engineering personalities. Among them were Douglas Miller, of the Brighouse club, and Dan Hollings of West Riding SLS.

E.T.W. stopped during his travels to give a lecture at Cleckheaton. Tom Senior made the arrangements and several local clubs were represented.

Model Engineer

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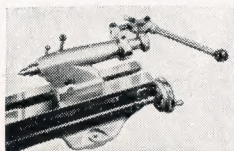
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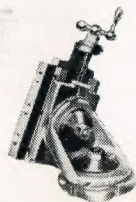
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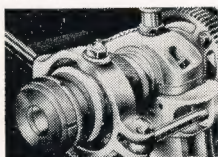
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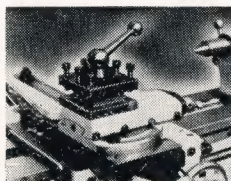
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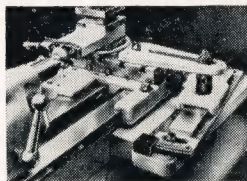
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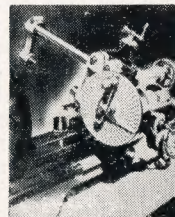
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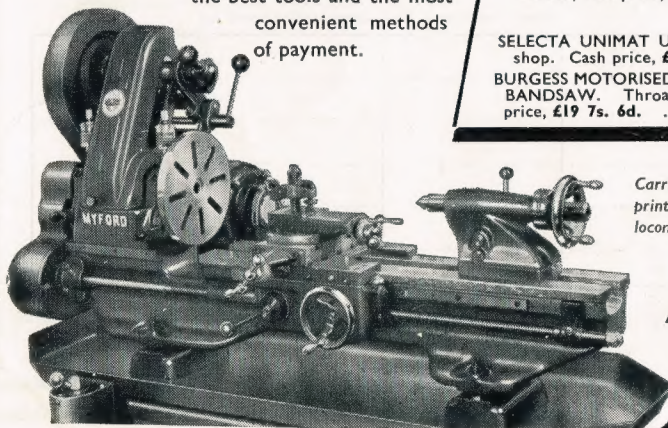
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